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THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

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Description of Moses Coombs's New Improvements, Represented in the Cut.

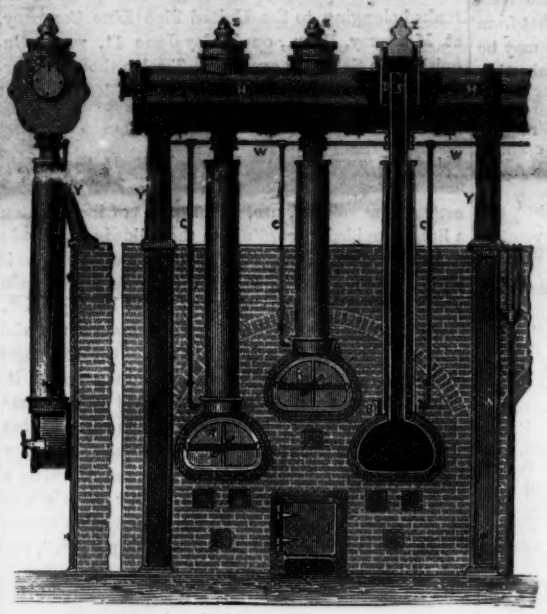
The double bells, marked B B B, are cast separate from the mouth-piece and bolted to the same, thus forming a flange joint at the mouth-piece. This enables us to bring the water down to the lowest point possible, thereby preventing stoppage at the mouth-piece, which would, once in a great while, occur in using water-jackets constructed on the earlier plan. This also makes a much better appearance, and is more complete in every respect. On the cut the following letters represent the different parts:

R R R, retorts; C C C, water pipes; B B B, double bells; J J J, water jackets: W W, water main; O O O, overflow pipes; E P, funnel and waste pipes; H H H hydraulic main; Z Z Z, acorn plugs; Y Y, extension of binders; S, continuation of stand-pipes; D, dip-pipe.

The improved hydraulic main shown in cut and represented by H H, is 8 feet 8 inches in length, 18 inches deep, and 18 inches across the center, directly at the top of the tar line. From this point it gradually diminishes in size, and at its base it measures 8 inches. By the cut it will be seen the main is supported by columns formed by the extension of binders, Y Y representing these, thereby always holding the main firmly in one position, and preventing the same from getting out of level. Whereas in the old plan the main generally rests on the brick work of the arch, which occasionally becomes troublesome by getting out of line. One of the advantages in this improvement over the old is the introduction of the ascension-pipes at the bottom of the main. As it may be seen, we have then a straight course for the gas to travel before entering the main. This does away with all bridge-pipes and their bends. With mains connected with bridge pipes, we have three and four plugs to take out in order to clear all the connections. With this plan we have only one (marked Z). By taking this out we have access to the ascension-pipe, dip-pipe, and main (or in other words to the whole thing). The ascension-pipe reaches as far as the middle of the bell in the hydraulic main. From that point to the end (marked S) is nearly an extension of the same, which always remains in its place, when the ascension pipes are taken down. The caps T T T T, six inches diameter on bottom of main, are placed there to give an opportunity for cleaning the main when desired. It will be seen that after the gas has entered the dip-pipe (marked D) the working of the main is the same as that of the old.

Any further information that may be desired in regard to the patent ascension-pipe of the new main will be cheerfully given on addressing M. Coombs, Jr., Youngstown, Ohio.

We may add still further that we earnestly commend to all persons connected with the manufacture of gas, and interested in improvements tending to make it cheaper and with less trouble, to call and examine these inventions of Mr. Coombs, now in full operation at the gas works at Youngstown, Ohio.



THE INVENTION OF MOSES COOMBS.

PREVENTING OBSTRUCTION OF STAND-PIPES OF GAS-RETORTS.

Letters Patent to William Edward Newton, of 66, Chancery Lane, in the county of Middlesex, Civil Engineer, for the invention of "Improvements in Apparatus for Generating Gas." A communication from abroad by Prof. Henry Wurtz, of New York city, in the United States of America (to whom it was communicated by the inventor, Moses Coombs, Jr., of Youngstown, Ohio).

Sealed the 14th June 1872, and dated the 28th December, 1871.

Provisional Specification left by the said William Edward Newton at the office of the Commissioners of Patents, with his petition, on the 28th December, 1871.

I, William Edward Newton, of the office of Patents, 66, Chancery Lane, in the county of Middlesex, Civil Engineer, do hereby declare the nature of the said invention for "Improvements in Apparatus for Generating Gas" to be as follows:

This invention consists in surrounding each of the stand pipes which conduct the gas from the retorts with a concentric cylinder or jacket, closed at the bottom through which a continuous current of cold water is kept flowing during the time occupied in carbonizing the charge of coal in the retort. The object of this arrangement is to prevent the stand-pipe from becoming highly heated as is usual (especially with clay retorts and high heats) to temperatures which cause the tar to become concentrated and thickened to a pitchy consistence, and thereby caked on the interior surface of the stand pipe,, so as completely to choke up the latter in a short time. By thus keeping the stand pipes cool the heat applied to the retorts may be urged to a high point without the least danger of obstruction of the stand pipes, so that from a bench of retorts double the volume of gas may be obtained, with an improvement in the illuminating power and the purity of the same. The tar which condenses in the stand pipes when the latter are kept cool is so fluid in its consistence that it will readily flow back into the retort, and being in part carbonized and volatilized again will add to the volume and richness of the gas.

Besides these advantages there is less work thrown upon the condensers and scrubbers, and all danger of condensation of tar in the purifiers will be obviated.

Specification in pursuance of the conditions of the Letters Patent, filed by the said William Edward Newton in the Great Seal Patent Office on the 28th June, 1872.

To all to whom these Presents shall come, I, William Edward Newton, of the office for patents, 66, Chancery Lane, in the county of Middlesex, Civil Engineer, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twenty-eighth day of December, in the year of our Lord one thousand eight hundred and seventy-one, in the thirty-fifth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said William Edward Newton, her special licence that I, the said William Edward Newton, my executors, administrators, and assigns, or such others as I, the said William Edward Newton, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an invention for "Improvements in Apparatus for Generating Gas," being a

communication to me from abroad by Prof. Henry Wurtz, of New York City, in the United States of America, upon the condition (amongst others) that I, the said William Edward Newton, my executors, or administrators, by an instrument in writing under my or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now [know ye, that I, the said William Edward Newton, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):

This invention consists in surrounding each of the stand pipes which conduct the gas from the retorts with a concentric cylinder or jacket, closed at the bottom, through which a continuous current of cold water is kept flowing during the time occupied in carbonizing the charge of coal in the retort. The object of this arrangement is to prevent the stand pipe from becoming highly heated as is usual (especially with clay retorts and high heats) to temperatures which cause the tar to become concentrated and thickened to a pitchy consistence. and thereby caked on the interior surface of the stand pipe so as completely to choke up the latter in a short time. By thus keeping the stand pipes cool the heat applied to the retorts may be urged to a high point without the least danger of obstruction of the stand pipes, so that from a bench of retorts double the volume of gas may be obtained, with an improvement in the illuminating power and the purity of the same. The tar which condenses in the stand pipes when the latter are kept cool is so fluid in its consistence that it will readily flow back into the retort, and being in part carbonized and volatilized again will add to the volume and richness of the gas.

]Editorial Note.—It must be observed that the letters below refer to the drawing of the invention attached to the English patent, and that it is not the same as in the cut of the *further improvements* on the preceding page.—Ed.]

Besides these advantages there is less work thrown upon the condensers and scrubbers, and all danger of condensation of tar in the purifiers will be obviated.

In the accompanying drawing Fig. 1 represents the front elevation of a bench of three retorts, R, R, R, to which the present improvement is adapted, the mouth piece and stand pipe S of the central retort being shown in vertical section and exhibiting the mode of supplying water to the water jackets, and also the mode of conducting off the overflow. Fig. 2 is a longitudinal vertical section through the dotted line *y*, *y*, in Fig. 1.

A, A, is the cold water main or trough supplied with cold water and situated at such height above the retorts as may be found convenient or necessary; this trough may be supported on the bridge pieces of the stand pipes or in any other convenient manner. B, B, B, are tubes which are usually made of about half inch internal calibre, and are furnished with cocks C, C, C, for regulating the supply of water from the cold water main or trough A, A, to the lower ends of the water jackets J, J, J; these jackets J, J, J, are of such dimensions as to leave a space for the water around the stand pipes S, of from three-quarters of an inch to one inch. O, O, O, are the overflow pipes through which inter-communication is established (in a bench of three) between all the water jackets. The overflow from all the jackets is conducted to a funnel and waste pipe F, P. In benches of five, six, or larger numbers of retorts, there may of course be provided two, three, or more series of overflow pipes at different levels in order more to equalize the heights or lengths of the water jackets. The proper way of arranging these jackets and pipes will be obvious to any mechanic of ordinary skill, and it is unnecessary to enter into more minute detail respecting them. It will be obvious that the object and purpose of the invention would be partially accomplished by covering the stand pipe with a jacket of a porous material which may be kept saturated with cold water by causing a current of water to keep flowing over the same. but the concentric cylindrical jacket above shown and described is considered preferable. While a bench of retorts is being first heated up (which occupies from ten to fourteen days) it will be found of advantage to keep a slight flow of water through the jackets in order to prevent the joints from burning out and leaking. When the first charges are made, the flow of water may be increased until the stream at F is from one eighth to three-eighths of an inch or more in diameter, according to the quantity of gas to be made.

If water is abundant, a three-eighths of an inch stream is always advisable, but a smaller one will be beneficial. In a larger bench the stream should be enlarged in proportion.

Having now described the invention which has been communicated to me by foreign correspondent as aforesaid, and having explained the manner of carrying the same into effect, I claim as the invention secured to me by letters patent the mode herein set forth of cooling the gas as it passes from the retorts up the stand pipes. I claim particularly enclosing the stand pipes of gas retorts within cylinders or jackets which are kept filled with water of a temperature lower than that of the gas evolved from the retort, as and for the purposes set forth.

In witness whereof, I, the said William Edward Newton, have hereunto set my hand and seal, the twenty-eighth day of June, in the year of our Lord one thousand eight hundred and seventy-two. W. E. Newton. (L.S.)

Chemical Repertory.

No. 135.—July 2, 1875.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1443. Oil and Lightning.—We still hear often of these oil-fires caused by lightning. It is reported that the fire caused by lightning striking one of the tanks belonging to the United Pipe Line Company, at Monterey, Penn., on Friday June 11, was extinguished on Saturday evening. Twelve thousand barrels of oil were burned, and the total loss is about $20,000.

1444. Light without Fire.—In Paris, the watchmen in all magazines where inflammable or explosive materials are stored, use, for purposes of illumination a light provided according to the following method: Take an oblong vial of the cleanest glass; put into it a piece of phosphorus about the size of a pea, upon which pour some olive oil heated to the boiling-point, filling the vial one-third full, and then close the vial with a tight cork. To use it, remove the cork, and allow the air to enter the vial, and then recork it. The whole empty space in the bottle will then become luminous, and the light obtained will be equal to that of a lamp. As soon as the light grows weak, its power can be increased by opening the vial and allowing a fresh supply of air to enter. In winter it is sometimes necessary to heat the vial between the hands to increase the fluidity of the oil. Thus prepared, the vial may be used for six months.

1445. Curious. Horace Wells, who did not discover anæsthesia, for it has been the knowledge and practice of men for a thousand years; who did not discover the anæsthetic qualities of nitrous oxide gas, for that discovery was made and recorded by Sir Humphrey Davy; who did not discover the anæsthetic virtues of sulphuric ether, the best safe means of abolishing pain in surgical operations, for that discovery was made by William T. C. Morton; nor of chloroform, for that discovery was made by Sir James Young Simpson, has admirers who are asking subscriptions for a monument to him as the discoverer of anæsthesia. Dr. J. Marion Sims and Colton the tooth-extractor see Truth in this Wells and put up 50 dollars apiece.— *World.*

1446. Glycerine as an Illuminating Material.—M. Schering states that glycerine may be burned in any lamp so long as the flame is kept on a level with the liquid. The latter, on account of its consistence, will not ascend an elevated wick. As the flame, like that of alcohol, is almost colorless, and as the material is especially adapted for absorbing a large proportion of saline substances, M. Schering has recently made experiments in coloring the flame with various bodies, and with satisfactory results. By introducing substances rich in carbon, it appears that the flame may be rendered suitable for illuminating purposes. The low price of glycerine, and its property of not volatilizing at high temperatures, add to its advantages in this direction.

1447. Gas-Heat to Make Salt.—A work of some magnitude has been recently entered upon in North Staffordshire (England) by a London company.—A shaft has been sunk at Lawton, in Cheshire, for the purpose of pumping up brine, to be conveyed by means of pipes to the coke ovens in connection with the Harecastle and Woodshutts colliery in North Staffordshire, a distance of two or three miles, there to converted into salt by means of the waste heat from the ovens. The cost of the undertaking will it is said, exceed $200,000.

Can not we lead the natural gas of our numerous gas wells in Pennsylvania and New York State to Syracuse, so as to use the heat of its combustion for the evaporation of the salt brine? If so, the State might not only sell the brine to the salt manufacturers, but also the heat required.—*Dr. Van der Weyde*

1448. The Petroleum Nuisance.—Conference of Health Commissioners in Brooklyn.—The Health Commissioners of New York, Brooklyn, and Long Island City held a conference in Brooklyn recently to take some action in relation to the petroleum nuisance on the shores of the East River. Dr. Concklin presented the following resolution passed by the New York Board of Health on the 2d inst.:

Resolved, That the Boards of Health of Brooklyn and Long Island City be and are hereby respectfully requested to meet this board for consultation and co-operation in respect to certain alleged nuisances which are complained of by the residents of the three cities.

Professor Chandler, of New York, said they had long suffered from these foul odors coming from the Brooklyn side of the river. He said they came mostly from Long Island City. Mr. Bodine, of Long Island City, said he knew of the existence of the nuisance complained of, but had not the power to prevent it, the charter of Long Island City permitting the manufacture of petroleum. One company, he said, turned out 10,000 barrels of oil daily, and all the companies have a strong hold on the city. Dr. Chandler said he looked at this matter as a chemist, did not wish to drive the oil companies away, but would adopt some other means to abate the nuisance. Dr. Janeway said he had been on Blackwell's Island, and that the odor there from these factories was very offensive. Dr. Chandler said it would involve but a small expense to alter the machinery and abate the nuisance. Dr. Conkling said, in conclusion, that the board had heard enough, and would take some steps in the matter.

1449. Magneto-Electricity.—The recent improvements in magneto-electric apparatus, in which, as is well-known, all expensive batteries are discarded, being driven by steam-power alone, at an expense of five cents per horse power per day, have given such encouraging results that it is anticipated that by further perfection powerful electric currents may be produced cheap enough to perform the operations of manufacturing chemistry, thus far performed by batteries, the hydro-oxygen blow-pipe, by furnaces or expensive chemical reaction, as acids, alkalies, etc.

1450. Hydrogen and Metals.—In previous researches on the metallic alloys formed by hydrogen, MM. L. Troost and P. Hautefeuille indicated the characters which distinguish these definite combinations from the solutions of hydrogen in metals. Potassium, sodium, and palladium combine with hydrogen, while a considerable number of other metals merely dissolve this gas. Iron, nickel, cobalt, and manganese offer striking analogies in the manner in which they behave with hydrogen at different temperatures. The facility with which they absorb or give

off hydrogen gas depends greatly on their physical condition. An ingot of pure nickel gave out, in a vacuum, at a red heat, one sixth of its volume of hydrogen. Laminæ of nickel, obtained electrolytically, gave out forty times their volume. Pulverulent nickel gave up one hundred times its volume, and remained pyrophoric after the escape of the hydrogen. An ingot of cobalt gave up one-tenth of its volume, electrolytic laminæ of cobalt thirty-five times their volume, and pyrophoric cobalt powder one hundred times. It remained pyrophoric after the loss of the hydrogen. Soft iron in ingots gives off one-sixth of its volume, and gray cast iron more than one-half. Electrolytic laminæ of iron gave off 260 volumes. In fine, it may be said that iron, nickel and cobalt absorb directly hydrogen gas, but it cannot be said that combination ensues, just as has been already shown in the case of lithium and thallium. Finely divided iron has a property which is not shared by nickel or cobalt; it decomposes water slowlv at common temperatures, and rapidly at 100°. In this respect iron approximates to manganese.—*Sc. Am.*

1451. Campaorated Phenol.—Bufalini describes the combination of camphor and carbolic acid.

If equal parts of carbolic and camphor be dissolved in alcohol, and the mixture be allowed to stand for 13 hours, a yellowish, oily stratum arises to the surface. This will not mix with the water or liquid, nor is the camphor precipitated by the alcohol. This substance is called camphorated phenol. It is best prepared as follows:

One part of carbolic acid and two of camphor are mixed in a vessel and allowed to stand for some ours. A reddish-yellow oily liquid will be formed, which is to be purified by washing with water. The properties of this combination are reddish-yellow color, oily appearance, smell of camphor, insoluble in water, but soluble in alcohol and ether. From considerable experience in its use, Bufalini concludes:

(1) Camphorated phenol produces the same effects as carbolic acid, but is less dangerous. It may be used both internally and externally, viz., in enteric fever, etc.

(2) It has the power of modifying unhealthy wounds and of destroying the parasites which are present in certain diseases, as septicæmia, typhoid fever. etc.

(3) The medical use of camphorated phenol is to be preferred to that of carbolic acid, as the former does not present the disadvantages of the latter.

(4) Camphorated phenol, when applied to wounds does not irritate them or act as a caustic or disorganizing substance on them, and may be used in large doses, without producing symptoms of poisoning.

Third Semi-Annual Meeting of the American Gas-Light Association,

At Washington, D. C., May 12, 1875.

[Continued from page 255.]

The President (Mr. Price)—Gentlemen: This paper is of the highest value, not merely in itself, but in what it may lead to. Here is some work that is worthy of the association, and I really hope that the members will take this occasion to follow it up, and question Mr. Forstall as to every point in this method. His article becomes the more striking when he states that he uses shell-lime. If this can be done with shell-lime what can be done with stone-lime? A question was raised by Gen. Hickenlooper how it is that this material being so hard, that the gas gets through it. All those points I hope the association will get out. When they have sufficiently questioned Mr. Forstall, then I wish to put a few interrogatories to him.

Gen. Hickenlooper—Do I understand that it is in this condition when removed from the purifier?

Mr. Forstall—Yes.

Gen. Hickenlooper—It of course is removed immediately after the gas is turned off?

Mr. Forstall—Two hours after.

Gen. Hickenlooper—Will gas pass through that mass? Could you do that now?

Mr. Forstall—I never have tried that.

Gen. Hickenlooper-It is in that condition when the purifier is open. How does the gas get through it?

Mr. Forstall—The gas continues to go through it while in that condition, until we turn the purifier off. I never have kept the purifier turned off and then turned the gas back again, to see whether any change took place; whether the gas would not flow through, but it is just as hard as that, when it first comes out. We break it with pick axes.

Gen. Hickenlooper—Then you think gas would pass through that mass in its present condition, under three inches pressure?

Mr. Forstall—A pressure of two inches will do it. The maximum pressure was two inches on the three purifiers.

Gen. Hickenlooper—Don't you suppose it is still moist when you shut the purifier off?

Mr. Forstall—There is a littte condensed water on the top, which falls from the cover; but the middle layer which does not get any water is just as hard as this sample is. This was taken out a day or two before I left (the 24th of April), and it had to be cut into pieces with picks. That was the last purifier opened before I left home.

Gen. Hickenlooper—What kind of a screen have you?

Mr, Forstall—Just a plain wire screen, with one inch meshes, and then the lime used on any kind of tray will do it.

Mr. Harbison—Have you ever removed the cover of the purifier immediately after shifting, so that you might see the condition of the spent lime there? I understood you to say it was done some hours afterwards.

Mr. Forstall—We have often removed the covers immediately. In fact, when we first commenced using the wet lime we did it always, and the lime was always in that condition. Now we leave the covers on longer, as a matter of convenience to the men. Sometimes we leave the covers on until the next morning. There is no fixed time for leaving them on after the change is made.

Mr. Harbison—Is there any difference in the amount of odor coming from the lime, whether the cover is immediately removed or whether it remains on for some time?

Mr. Forstall—No, sir, I think not, because the longer the cover is kept on the box the longer the odor is kept in, and the lime begins to heat as soon as the cover is taken off. There is always a certain amount of heating going on, and then the odors are developed. I do not think that makes any difference,

Mr. Edgerton—I will say that is is simply due to more complete absorption of carbonic acid. The preparation of the lime with a large amount of moisture allows a complete absorption of the carbonic acid. The purification in the centre of the lime nodules or lumps is due to the fact that the excess of moisture allows the transmission of the impurities to the center. The gas itself has no access to the centre of the lump, but any impurity absorbed at the surface is transmitted to the centre of the lump, owing to its very moist condition. That, I think, I have demonstrated to be the fact, by numerous trials.

Mr. Harbison—In what way does the gas get through, as this is not cut up into cakes, but is one mass over the entire surface of the tray? If it does not penetrate through how does it get from the bottom of the pan to the top?

Mr. Forstall—It does pass through under a pressure of about two inches.

Mr. Williams—Did Mr. Forstall notice any variation in pressure when the gas was first on and freshly-charged; between that time and the close.

Mr. Forstall—There is a gradual slight increase from the beginning to the end, but very slight. In those 28 days the increase on that purification was only about half an inch. The purifiers are 25 feet square.

Mr. Williams—That is a very large surface, and of course the gas would pass very slowly through it, although that appears very hard. Nevertheless gas would penetrate it, as we all very well know.

Mr. Forstall—We did work it in the old purifiers They were working with lime six inches thick during the winter of 1873, and we purifled 20,000 feet to the bushel of lime. We had a pressure of 15 inches, as against 18 inches two years before, with only one-quarter of the quantity of lime.

Mr. Walker—Mr. President: Some of the gentlemen may think that because Mr. Forstall has sworn to what I have said about Sunday-labor, that I am going to swear to what he has said about the purifying business; but it so happens, from a hint dropped to me by Mr. Edgerton here some year or two ago, that I went to work last fall, having been heretofore troubled with small purifiers. I could'nt get any gas through without considerable increase of pressure, and I went to work, preparing my lime in this way. (It was stone lime.) The manner of preparation with me has been to slack it thoroughly, and then wet it down well with a hose, pile it in a good big pile, let it lay there for a week or ten days, and break it up with a shovel. I found it very nearly in this condi tion (of Mr. Forstall's specimen) at that time. I commenced using it in that way.

Mr. Price—Hard, did you say?

Mr. Walker—No, sir, just like this. I commenced using it in this way on four trays, about 2½ inches to a tray. I have had great success with it, and no trouble with pressure, make a great deal more gas and get it through perfectly easy. I found the lime broke off the trays in cakes like this. I commenced within the last four months using just two trays, first with 6 inches and then I got to 8 inches, and it comes out in this same condition, and I have no increased pressure from it whatever.

My purifiers are small enough for the work being done, but I have not the slightest trouble with it. I think myself that exposure to the atmosphere hardens it a little more, and makes it look more solid. When it comes out I have to take a shovel, and break it up. We have been purifying about 8,800 feet to the bushel of unslaked lime. This is the best I can do with it. We use stone lime.

A member—What kind of coal do you use?

Mr. Walker—Youghiogheny coal. I have had great satisfaction in using lime prepared in this way, and it shows like this specimen when it is thrown out into the yard.

A member—What did you formerly get? 9,000 per bushel don't seem to be much compared to Mr. Forstall's experiment.

Mr. Walker—I know it. I didn't get more than 5,000 formerly. I should like to know the difference between shell and stone lime for purification.

Mr. Sutton—I have been in the habit for 10 or 15 years of buying stone lime that is slacked and prepared for agricultural purposes. I now buy unslacked lime. On the Hudson we buy it for about 5½ cents a bushel. We used to think we could not use anything but slacked lime. I think we purify about 5,000 feet to a bushel of lime. I do not think we ever purified over 6,000 feet with a bushel of slacked lime.

The President (Mr. Price): I should like to have Mr. Breese state his experience in this connection.

Mr. Breese—Mr. President—I am afraid to state it now. Some 18 months ago I heard that Mr. Forstall was purifying 48,000 feet to the barrel. I never like to hear of anyone doing any better than I want to do myself, and I went to work on the lime. I think it is bad policy to buy lime slacked. I think the best policy is to buy unslacked lime and slack it yourself. The gentleman who just rose might buy lime that was slacked in the kiln that would make nothing by wetting down; but the lime that we buy slacks about 2½ bushels to the bushel of dry lime. I do not think that I do good work unless I purify from 35,000 to 40,000 feet to the barrel, and I have purified 48,000 feet and over. That was slacked lime.

Mr. Price—To the barrel of slacked lime?

Mr. Breese—Yes, Sir, Mr. Lewis, our President here, will furnish you with the data to show that we did not run less than 30,000 feet right along. I do it on the same plan that Mr. Forstall pursues. I wet

my lime down and shovel it over. It is so wet that when I wheel it in in wheelbarrows, there is from an inch to an inch and a half of putty sticking on to the wheelbarrows, and the men before they go home kick it off their feet.

Mr. Price—You say that your stone lime, after being slacked, becomes two and a-half bushels. Do you mean to say that you ordinarily purify 30,000 feet of gas to each bushel of slacked lime?

Mr. Breese—No, Sir; to each barrel.

Mr. Price—That you purify 75,000 feet of gas to a barrel of stone lime?

Mr. Breese—Yes, Sir; I carry that out to the purifying house, and it comes out of the trays like oil-cake.

Mr. Price—Is it as hard as this specimen?

Mr. Breese—Yes, Sir.

Mr. Price—What about your pressure?

Mr. Breese—My pressure increases always after running a box from 8 to 12 hours. It gradually increases, but after that there is no increase if I should run the box 24 hours. It increases shortly after turning the box on.

Mr. Price—What is your pressure?

Mr. Breese—From 4½ to 7 inches.

Mr. Price—How much does it increase?

Mr. Breese—It increases after running it from 6 to 8 hours, to about 7 inches, and will stand at about that.

Mr. Price—What are the size of your purifiers?

Mr. Breese—25 feet square.

Mr. Price—How long are you able to use this lime before charging?

Mr. Breese—Sometimes I run 4 days and sometimes 6, depending on circumstances. I change a little oftener sometimes. In Detroit they are changing all the cobblestone pavements into wooden ones, and they give me cobblestone lime, which necessitates changing a little oftener, but the cobblestones all originally came from Canada.

Mr. Price—Do you attribute that to the inferiority of the lime?

Mr. Breese—No. I attribute that to the inferiority of the stone.

Mr. Price—It produces an inferior lime?

Mr. Breese—Yes, Sir.

Mr. Littlehales—How much of your four inches of pressure is due to your holder, and how much to the purifiers?

Mr. Breese—As soon as I change my purifier I have four and a half inches of pressure, and for the first three or four hours the pressure is only some three or four-tenths of an inch, different perceptibly. But in about six hours it runs up to five, and from 5 to 7 inches, and runs along in that way until the latter end.

Mr. Littlehales—How much is the lime on all your trays?

Mr. Breese—From 2 to 2½ inches.

Mr. Littlehales—How many trays?

Mr. Breese—Seven courses of trays in the box.

Mr. Price—Has your gas been analyzed lately that you know its purity?

Mr. Breese—There are some three or four gentlemen here, who have been out in Detroit this winter, and analyzed the gas. I would rather they should give their opinion.

Mr. Price—Have you a system of inspection in the city?

Mr. Breese—The system of inspection is simply the ordinary system of using test papers that are used in gas works usually. Test papers are used every morning and every evening.

Mr. Price—Do you prepare the lime some time before you use it?

Mr. Breese—No, sir. I frequently use it while it is hot: that is, while it is steaming. I would rather use it that way than any other. I can do better in that way by from 5000 to 8000 feet to a barrel. If I can take my lime, slack my barrel of lime, and put it immediately on my trays and close my box, I can gain from 6000 to 8000 feet more to a barrel.

Mr. Price—How many bushels do you put into each purifier?

Mr. Breese—I put about 300 bushels.

Mr. Price—What is your maximum make in the winter?

Mr. Breese—Pretty close on to 600,000 feet.

A member—How deep are your purifiers?

Mr. Breese—Fifty inches I think is about the depth.

Mr. Cranshaw—I would like to ask the gentleman what coal he uses in the Detroit works?

Mr. Breese—We use Youghigheny coal and Ohio cannel as an enricher.

Mr. Price—What per cent of cannel do you use?

Mr. Breese—From 18 to 25 per cent.

Mr. Littlehales—What is your preparatory treatment of your gas before it comes through the purifier. Do you wash or scrub?

Mr. Breese—I scrub and wash both, and run the gas through about 250 feet of 20 inch main pipe.

Mr. Littlehales—I think that is where the secret lies. It is a well known fact that if you pass the gas through the purifier very slowly the lime will absorb two, and even three fold the amount of impurity that it will when it is being forced through rapidly. You may also scrub and wash out fully 50 per cent. of both the sulphuretted hydrogen and the other impurities of the gas, and you also take out the ammonia by the washing and scrubbing, which you do not free it from so well by any other means. Has Mr. Forstall any system of either scrubbing or washing, for I believe that is where the secret lies.

Mr. Forstall—The stress I laid was not upon the actual duty of the lime, but upon the difference produced by the increased moisture. The other conditions were the same in both instances. Our condensation is just as slow as we can make it. We use scrubbers and washers or rather they are combined; but from the time we used the dry lime until we used the wet, there was no change made in the other circumstances of purification—in the condensing or scrubbing processes.

Mr. Littlehales—Was there any change made in the manner of putting the gas through your purifier?

Mr. Forstall—No, sir.

Mr. Littlehales—In every case it worked up through or down through.

Mr. Forstall—Up through.

Mr. Littlehales—My own idea is this—that the true explanation is in the gas being allowed to pass very slowly, and scrubbing. Some American engineers I know are very strongly prejudiced against water. As Captain White explained at our last meeting, he thought every bit of water would spoil the gas. I believe that is altogether a mistaken idea. I might quote you one works where they have been trying very hard to purify the gas lately by the scrubbing and washing process, and after passing through six scrubbers in succession, they found the loss so trivial as not to be worthy of consideration.

They succeeded in purifying their gas wholly by scrubbing and desulphurizing the ammoniacal liquor, and using it over and over again, it having great power to absorb the sulphuretted hydrogen. The simple reason that it was abandoned was that it cost more to desulphurize the liquor than was saved. But that gas can be purified to a large extent both by water and ammoniacal liquor there is no doubt, and I believe in both those cases it is due more to the preliminary treatment of the gas than to the difference in the lime.

Mr. Forstall—The preliminary treatment having been the same at both times, the difference between one set of figures and the other set must be due to the only difference made, and that was the wetness of the lime.

Mr. Littlehales—The water is doing the duty after all.

Mr. Forstall—Well, water is cheap and lime is dear.

Mr. Littlehales—Yes, but I believe you would accomplish precisely the same results if you did not wet the lime so much. We can only manage to purify about 12,600 feet in Hamilton with Canadian lime—good stone lime. That is per lime-burners bushel unslaked lime; about 75 pounds per bushel.

Mr. Breese—I wish to explain one little circumstance here which I had forgotten. We have two sets of washers or scrubbers, and two sets of condensers, besides the 250 feet of 20 inch main pipe, and the gas passes all through this before going to the purifiers. The gas passes through one set of dry scrubbers. They have screens in them. They have a set of dry screens in each one of them. After that there is a spray condenser. There are then two sets of condensers which are both run dry, without any water. We never run any water in them at all, and have no occasion to do so. By examining the gas after it comes from the condenser I find it much more pure than I used to before the two sets were connected together.

Mr. Neal—Whenever I ask a gas engineer how many feet of gas he will purify to a bushel of lime I mean, "How many feet of gas do you purify to a bushel of lime put in your purifiers?" That is the standard, and I am delighted to find that my purifiers work so well. I have discovered that instead of 5000 feet to the bushel I purify 10,000. Mr. Forstall says that oyster shells converted into lime will expand, so to speak, and that one bushel of oyster shells will yield two bushels of lime.

Mr. Forstall—A little less than two.

Mr. Neal—Well, a little less—say a fraction. Now, I take those two bushels of lime and put them into a purifier, and I say one bushel of that lime purifies 5000 feet, I am delighted to learn here that I purify 10,000 feet to the bushel.

I think when we speak of the purification we do not mean lime in a shed, or ten miles off, but the lime that you put in the purifier. You put 100 bushels of oyster shell lime, or lime from paving stones in the street into your purifiers, and the purification is at the rate of 5000 feet to a bushel, you purify 5000 times 100; 500,000. That is the standard, as I say, not of lime in a shed but in the purifier. Now, there is some difference or discrepancy here. One takes the unslaked lime and reckons it before it goes into the purifier, and the others say that it purifies so much of lime in the purifiers. Let us have one standard.

Mr. A. Sutton—From the books of the Manhattan Company of New York it appears that they purify 6,420 feet to a bushel of lime; oyster shell lime; I presume slack-lime. Fairmount coal, 2282 feet. Sterling coal and Ohio coal, I believe, is put down at 3,993 feet. Another West Virginia coal is put down at 2,480 feet. Clover Hill coal 3,322 feet. Newcastle coal, 3,500 feet.

Mr. Walker—In discussing this matter of the quantity of lime we have lost sight apparently of the main question—the preparation of the lime. Perhaps Mr. Edgerton could tell us something about that. He, I think, has been making the subject a study.

Mr. Edgerton—I would say that Mr. Littlehales is right in attributing the increased result to water in the lime. That is the fact. It is due to the water in the lime, but it is in this way that it enables the lime to do the greater duty. It enables the lumps as they form to absorb the impurities to the centre.

If you will place a lump of prepared lime on the top tray of the purifying box when going into action, and take it out as it comes ground in turn, you will find if the preparation of the lime is proper, the purification has gone on to the centre, and it will be saturated with either carbonic acid or sulphuretted hydrogen.

The hardness of the lime is due to converting it into a sort of limestone again, and that can only take place when the lime is decidedly moist. That is clearly the reason why the moist granulated form of lime has greater action on the gas than the comparatively dry. So that really the moisture does not absorb the impurities, but enables the lime to do its proper work.

Mr. Crenshaw to Mr. Forstall—Do you apply the same tests to your purifier before changing as is ordinary?

Mr. Forstall—We use the turmeric paper test for

ammonia, and sometimes the nitrate of silver solution for sulphuretted hydrogen, but we are in the habit of running our purifiers until every layer of lime will soil, but the last one. We have test cocks between each layer of lime in the purifier, and I think one of the reasons why our sulphur impurity is so small is because we have followed Mr. Anderson's plan of running the purifiers as long as we possibly can, before making changes.

That, however, does not affect the purification from sul huretted hydrogen at all, but merely the purification from bisulphide of carbon, and I did not say anything about it, because I wished to confine myself to one single point in my paper. The manner of working the purifiers I consider has nothing whatever to do with the manner of preparing the lime for the purifier. We however make no change until every layer of lime in the three purifiees, but the last one, will soil. The man watches that last one closely, and as soon as that second layer soils in the last purifier, leaving in one clean layer, then he makes his change.

Mr. Walker—I said I got 8,800 feet. I will state the way I work it, to give gentlemen an idea, and to compare the difference between the two systems. I test by the middle purifier always, leaving the third always clean. I change whenever it soils on the second purifier.

Mr. Neal—I propose a vote of thanks, with all my heart, to Mr. Forstall. for his able, instructive, and exceedingly interesting paper.

Unanimously carried.

The association then adjourned for supper.

Evening Session.

The association re-assembled at 8 o'clock, P. M.

The President (Mr. Price)—I suggest as a topic of discussion for the evening, the economical use of tar as gas fuel. There are gentlemen here who have had experience, and who could perhaps tell us how they are using it, and with what results. Gen. Hickenlooper, whom I see before me, has had plenty of experience.

Gen. Hickenlooper—In referen.e to tnat I may say that I am totally unprepared to make any remarks on that subject. I would prefer to postpone it until some other occasion, when I can give statistics in regard to it. Still, I can say this much, that about two years ago the accumulation of coal-tar was such with us, as to be a formidable matter, amounting to 18,000 barrels, and when you have no market for it, it is impossible to get it off at any price, even to give it away; so that it became a matter of necessity to devise some way to get rid of it. We commenced by attempting to use it as it had been previously used in other works, by injecting it in connection with steam, and occasionally firing up by coke. We found, upon trying it that way for some time, that it consumed the tar but gave us no equivalent return; that we had to fire continually with coke. It finally resulted in our adopting a plan which I will endeavor to roughly describe, and which we are using now. We have sealed its value at the different values of coke. We are now selling coke at 6½ cents a bushel, at which price the tar nets us $1.75 a barrel for fuel.

The most essential feature necessary to success is to keep the tar perfectly free from mixture, so that we have now arranged to keep it entirely under cover—perfectly dust-tight, going from the different receptacles into the well, which has been covered with a dust-tight roof. It is pumped from these with a small steam-engine to the tank, which is a boiler raised three feet above the end of the benches at the end of the retort-house, from each end of which runs along the base a pipe 1¾ inches in diameter. At each of the partition lines on the benches there is a branch pipe running down terminating by an ordinary stop-cock that discharges into the funnel, from which a pipe leads into the iron trough, sloping at an angle of 30 degrees with the horizon. Immediately underneath the tile is a fire-brick arch, for the purpose of protecting the tile from the excessive heat of the tar. In starting the bench the coke-fire will have to be built under this arch, which corresponds to the ash-pan of an ordinary bench, the spring of the arch being from the top of the ash-pan. That heats the arch and the tile red hot, upon attaining which heat you turn on the tar, which falls into this spout and falls on to the tile, is there vaporized, the unconsumed portion is consumed before it reaches the bottom, and aided in combustion at that point by red-hot air (as you may term it) which passes in below the arch and above the coke. On striking the inclined tile it forms a coating, which is pushed back by the man in charge, with a very light stoking iron and drawn forward to the front through the arch below, keeping a hot bed of coals underneath, from which and between which and the top of the arch the air necessary for combustion passes. That produces perfect combustion, so that we have a steady stream of tar flowing, about the size of a knitting-needle, which runs from one month to another, and requires no attention except to push back this coating.

A member—Do you stop it Sundays?

Gen. Hickenlooper—No Sir; it has not yet stopped Sundays. Some gentleman here announced that his gas arrangement would run without any attention, except some attention to the fires. Now, our gas would require some attention, but no attention to the fires; but if we could combine these things together, we could let the thing run itself.

Mr. Richardson—Mr. President: I cannot give as full an account as the gentleman who has just addressed you. We have been using a very simple form indeed—merely pumping the tar up into the cask on top of the benches of retorts, so as to give us a pressure on the pipe, and bringing down a half inch pipe in front, on which is placed a valve for regulating the flow, one end of the pipe which conveys the tar into the furnace is reduced to about one-eighth of an inch—the tar from which flows into a trough placed at an angle of about sixty degrees, fixed in the front wall of the bench, about ten inches down the door frame. The trough is made of sheet iron, one-half circle of 2½ inches diameter, and extends to the inside of wall, at the point of the one-eighth inch application, and in its rear we have a small jet of steam, partly superheated, which carries the tar into the furnace in a fine spray, and instantly becomes volatilized and consumed. In the furnace door we have cut a hole of say 3 inches diameter, and which is covered by a slide, the object of which is to regulate the quantity of air necessary for the proper combustion of the fuel, and for allowing the introduction of a bar for any necessary purpose. Since we commenced the use of tar, we have used no coke. We find there is a sufficient deposit of lampblack in the furnace for our purpose, and with no accumulation beyond that which is necessary. We were led to its use from economic principles—its sale had almost ceased, and our tanks were full. I would state that although our coke sells for only six cents per bushel, the quantity often used, its heat and that of the amount of coke necessary being equal, is equivalent to selling it for $1.25 per barrel. I will say further that you can keep up any desired heat you like. We have the above system in use since last winter and we find no extra deterioration of retorts.

A member—How far would it go towards fuel—would the bench supply its own fuel?

Mr. Richardson—No, Sir.

Mr. Walker—I have been afraid to tell what I knew about it until I heard what others had to say; a man is apt to be caught. About three years ago I found our contractors would not buy the tar any more. They said it was not worth anything; they could buy pitch. I rigged up two benches for furnaces, took out the grate bars and built them up solid, with a sloping furnace, and started away. It didn't get along very well because the man was determined it should not work, and I was determined it should. I finally succeeded well and started another bench. I used to run it the same as General Hickenlooper mentioned he did. I had no difficulty with it. Some of the folks found it was better to buy our tar. Some of these gentlemen are running similar works, and they want to use the tar too. I have used it a great many years ago, along with coke. When you use it along with coke, use it in just the same way—let it run in, but don't stir the fires while using. For instance, you can use all the tar by having a little movable spout that goes in at the top of the door—over the door. You would have to cut a hole in the door, and it is easier to close up a hole in the brick-work than in the door. I should say made a hole about 2½ inches square, and when you are done using your tar—when you have no more to use, just draw out your spout and close up the hole. The pipe will burn off if you stick it through the hole. A little cast iron shute is the best thing. Don't stick it very far in. If you go in too far you will burn off the end of it. A little carbon or coke will gather on the end of it, but you can push it off with a little chisel. That is the way to use it.

A member—Will a barrel of tar carbonize a ton of coal?

Mr. Walker—Yes, Sir; with the tar furnace alone, without any coke. I found in some parts of the old country that is what they are using. They have not made any improvements there in thirty years in using coal-tar.

A member—Then where three benches are being used, one would be enough to run with tar?

Mr. Walker—Yes: that is about all you can do, and barely that.

A member—Do you have any smoke?

Mr. Walker—Not if you regulate the quantity of air. I regulate the proper quantity of air by a register in the door to open and shut. There was a very little air went in where the pipe went in; but I depended mainly on the hole in the door. You must admit sufficient air to consume the carbon. There is no accumulation of carbon on the outside of the retorts.

The President—Mr. Nettleton has used it 3 or 4 years and is willing to give his experience.

Mr. Nettleton—It is something over three years since I began to burn tar under my retorts. My way of burning it is substantially as others have described it. My tar runs into my tar-well, and there gathers a sediment, somewhat, so that it was obstructed in the delivery-pipe, from time to time, and I had to put a grinding appliance in, in order to make it run a uni form, steady stream. I think the price was ten dollars that I paid for it. I found (or my men did) in use, that we got better results by burning about half the usual quantity of coke with the tar, than when we burned tar only, or coke separate from the tar. We made a very careful estimate of what the tar was worth per gallon, to burn for fuel, so much so that when we we had an offer of three dollars a barrel for our tar, the contractor offering to furnish his own barrels and do his own pumping, we told him it was worth more for us to burn under the retorts than it was to sell to him at that price, getting 12 cents a bushel for our coke. That is my experience. We get a more uniform heat, and absolutely better results in the making of gas when we use tar, than when we use coke only.

A member—I have no tiling under my retorts; I set them entirely on skeletons. Would there be any trouble in its going directly on the retorts?

Mr. Nettleton—Yes; I am satisfied there would. The tar would act in the nature of a flux, at the point of contact, and eventually make a hole in the retort. I put it in directly over the furnace door, and run it back so as to strike on the coke, four inches inside of the wall. I use an ordinary tile. If I put in a piece of cast-iron, as some have suggested, it would burn off. We put in a piece of tile and it stays there, and when we don't want to burn tar we put some luting material in the tar orifice and then burn coke. It can be changed quickly.

Mr. Walker—There is no necessity of burning the retorts out any more with coal-tar than with any other fuel. You must adjust the quantity of air and carbon so that the carbon will be entirely consumed. Some think it is all the same to mix the tar and coke before putting it in. They will find out it is not. They will soon get a bench melted down in that way. I have seen it tried and it soon gave out; the retorts, furnace, and everything else. I would not advise any-

body to try that experiment. You can adjust the quantity of tar to keep your heat, better than with the coke.

A member—The flame from the tar will not be likely to injure the retort any more than from the coke?

Mr. Walker—No, sir.

Gen. Hickenlooper—On the contrary, you get a better heat, because you do not have to open your furnace door.

The President—Mr. Breese has a system of burning tar, and I should like to hear from him.

Mr. Breese—Mr. Price has seen my mode of burning tar in Detroit very recently. I have an arrangement for burning tar, by which it is not necessary to have a tank on the top of your benches, or any where else. The grate-bars are simply covered over with ashes and the sweepings of the floor, and the tar-burner itself is introduced immediately over the furnace-door, and you stop up the hole. There are very few gas men or gas engineers but what leave stopper holes immediately over their furnace doors, for cleaning out their furnace or their flues—sight-holes is the proper name given to them. I introduced a half-inch pipe into that hole, took out the stopper and put in a Gifford injector, and with my Gifford injector I can raise the tar from the well outside of my retort house anywhere within the limits of an ordinary pump. I have never had an opportunity of raising it over or above ten or twelve feet, but I have raised it ten or twelve feet. But in my way of using it the heat becomes so intense that I have to introduce air, and I have an air-cock on the tar pipe. There are two jets precisely like a Gifford injector, and on the tar side of the pipe I have an air valve by which I regulate my supply of air so as to control my heat, and it answers about the same purpose as a blowpipe. Mr. Walker says it cannot very well burn out a clay retort. But the way I manage it, you can burn out almost anything, and the trouble is to keep your heat regulated so as not to burn your bench out. The *modus operandi* under which I burn it, requires no tank over your benches, if you do not want it. My drain passes from the purifying house and from the condenser room to the washers, taking in all the drainage from the works, and I get not only that but I get that from the water closets which the men use, and in which there is a large amount of paper and refuse matter, that will not run through the pipes very well, unless I have a tank up above from which I can feed. And yet I can take the manure from the stable and force that through the pipes. I use a little jet about the size of a darning-needle for my steam, and one-eighth of an inch for my tar, and I regulate the whole supply with my steam. I can draw the heavy tar about ten feet. Mr. Price, your President, has been recently looking over my arrangements for burning tar, and knows something about the heats I get.

I have experimented on both the crude oil and naphtha, and can burn anything in the shape of liquid fuel in that sort of arrangement. It is precisely on the same principle as the Gifford injector. I can raise my liquid fuel to about the same height proportionately to the weight of the material. Tar being heavier than water I cannot raise it as high as water, but I have raised it ten feet. It requires nothing on the grate bars. I have a man sweep the floor up and throw the sweepings on the grate bars, and the desideratum is to keep your grate bars covered up with something that offers no fuel at all. You have all been into barber shops at some time, and those India-rubber bags that they force the perfumery on to your faces acts on the same principle precisely. It forces it into the bench in precisely that same way. It forces the tar into the bench in so fine a stream that if there is no fire in there you do not see the tar at all. But if the bench becomes hot it looks like a solid belt of stars. It is a perfectly white heat.

The President—What is the economical result of it?

Mr. Breese—I will give you the result of last month. I burned last month under nine benches 225 barrels of tar, saving 6000 bushels of coke in reality. Coke with us is not a very saleable article; neither is tar, We get $1.25 per barrel for tar, and for coke we get 7 to 8 cents per bushel. We have a contract at $1.25 to take all the tar we make, but according to the way I have been running it it does not pay to sell tar any less than $3 a barrel at our works. But if you work exclusively on your hydraulic main (which I did on the first start) you will do as I did. I unsealed every one of my dip-pipes. I had a great deal of trouble by taking my tar from the hydraulic main; so I took it from the tar-wells, after having provided an overflow for the water and refuse material.

Mr. Walker—How much coal do you carbonize per bench, with your tar?

Mr. Breese—I could not say precisely the amount of coal, but I cannot go over $5 per bench a day for fuel. I am running now sixteen benches. The trouble is that I cannot very well, without considerable attention, keep my benches cool enough in working the tar in that way, without working quite a quantity of air.

[To be continued.]

Louisville Gas-Litigation—Gas-Meters.

[We owe to Prof. James Lawrence Smith, President of the Louisville Gas-Light Company, the following document, in MSS. copy, from the records of the court. Our readers have had accounts of previous proceedings in this case —Ed.]

Kentucky Court of Appeals, April 15, 1875.

George F. Fuller vs. Louisville Gas Co. } Appeal from the Jefferson C. P. C.

The Court being sufficiently advised delivered the following opinion herein:

The instructions given presented the whole law of the case to the jury. The jury was told for the plaintiff, that under the contract it was the duty of the defendant to furnish as nearly as practicable, as many feet as it received payment for.

By the third instruction that if the meter of the defendant used in the measurement of gas to plaintiff were not correct within that degree of accuracy which was practicable to attain, and that defendant has charged to and collected from plaintiff an amount beyond the gas which he received, they should find for the plaintiff to the extent of overcharge and collection; and further that plaintiffs agreement to accept gas by meter measurement does not affect his right to a measurement as nearly correct as practicable. This third instruction explained fully to the jury what was meant by instruction No. 2 in which they were told it was the duty of the defendant to measure the gas with reasonable correctness. It was shown by all the witnesses on the subject that reasanable accuracy in the measurement was not only all that could be required, but all that could be attained, and by most if not all who testified on this point, that the meters used were as correct in measuring gas as it was possible to make such instruments. Nor can we perceive any error on the part of the Court below in refusing to permit the testimony offered as to the quantity of gas consumed in 1868 and 1869 to go the jury. After the meter with which the gas had been measured had been fairly tested, the plaintiff offered to prove that from November 1868 to April 1869 the same business had been conducted in the Opera House as was conducted from September 1870 to May 1871, the last named months constituting the time during which the appellant used appellees gas, and that from November 1868 to April 1869 the *house required* the same average amount of gas and light weekly, and that the same meters or others similar and tested in the same way had been used; further, that the defendants' bills for gas during the first named period varied several thousand feet each month.

It is not shown that the appellant was then the proprietor of the Opera House or had during that time contracted for gas from the company, but on the contrary it is to be inferred from what appellant offered to prove that some one else was then controlling the house, and although it is stated that the house required the same light, and that there were the same number of burners during each period, it is not stated that the gas was in fact used the same length of time, or that the party in possession between November 1868 and 1869 was as careful in shutting off the gas or in economizing its use as appellant had been. It was an effort to show that the measurement was incorrect or the meters defective, by proving or offering to prove that two or three years previous there had been a discrepancy in the gas bills against the proprietor of the same house, without even stating that the gas had been burned for the same length of time with the same number of burners. The house might have required as much gas and still not as much have been used. This character of evidence, if even admissable, when the facts appear as indicated thus should, in order to make them competent, would be entitled to but little weight when compared with the test made by men of science, and were certainly incompetent as offered to be proven were such as they are construed to be by counsel in argument, viz., that the same meters with the same burners and light for the same length of time in the same house, and controlled by the proprietor or his agents in the same manner made the variance in the measurement suggested, there would then be no reason why such evidence should not go to the jury upon the issue made. There was no offer to show that the gas was burned the same number of nights or the same number of hours each night, and to permit such proof would be to measure appellees gas by the mere opinions of men as to the quantity that would probably be consumed during any given period, and this by comparing the quantity used by one man during one period by the quantity used by another in the same house at a different period, but occupying it the same length of time. Such a test would not be relied on, and there is no reason for adopting it, when there is a test approximating as near accuracy as it is possible for human ingenuity to attain. The judgment of the court below is therefore affirmed.

[Attest a copy.]

State of Kentucky, } Jefferson County, }

Jefferson Court of Common Pleas, Held on Saturday, December 9th, 1871.

George F. Fuller, Plaintiff, *vs.* Louisville Gas-Light Company, Defendant.

This day came again the parties by their counsel, and the jury empannelled and sworn herein again appeared in the jury box, and retired to consider their verdict, and afterwaads returned into court and upon their oaths say, "We of the jury find for the defendents. Richard S. Herr, Foreman.

It is therefore ordered and adjudged that the plaintiff take nothing by his petition, and that the defendant go hence with delay and recover of the plaintiff its costs herein expended and may have execution.

John S. Cain, C. J. C. C. T. C.

[A copy—Attest.[

Water-Supply Items.

Croton.—Governor Tilden signed, May 28, two important New York bills known as the Repaving and Croton Aqueduct bills. The act relating to the Croton Water Aqueduct provides that the powers of the Commissioner under the well-known water acts of 1870 and 1871 shall be exercised by and with the advice and consent of a three-fourths vote of the Board of Aldermen. Under this sanction bonds of the city are to be issued to the amount of $1,500,000, but not more than $500,000 in any one year, to pay for the extension of the Croton mains into the new wards, to Randall's, Ward's, and Blackwell's Islands, and for larger mains in some streets.

Fire! Fire!—The reported losses by fire during the month of May were: In New York and Brooklyn, $618,600; in the United States, exclusive of these cities, $8,127,200; aggregate, $8,745,200. Losses in United States during the first five manths of this year reported, $38,004,500. These facts, in connection with the fact that the gross earnings of the nation are $7,000,000,000, nine-tenths of which are consumed for current living, leaving only $700,000,000 net accumulation, and some statisticians place the consumption at a higher figure, leaving only 5 per cent., or $350.000,000, net earnings, furnish food for serious reflection. That nearly 30 per cent. of the net earnings of a people should be annihilated by fire, is by no means an evidence of prudence. And a large portion of this destruction is preventible by proper caution.

Philadelphia.—Mayor Stockley has appointed Messrs. Willi m J. McAlpine of Albany, William Milnor Roberts of New York, and Fairman Rogers, William E. Morris and Solomon N. Roberts of Philadelphia, the commission under the ordinance of councils authorizing a commission of five persons out of eight to be nominated by the Franklin Institute, to consider and report upon the present and future water supply of Philadelphia.

Cincinnati, June 11.—In the water works investigation to-night, the accountant who had been employed to examine the books reported that delinquencies on the part of the collectors were very few prior to 1873. Since that time the amount of delinquencies had increased from about $7000 for the last half of that year to about $35,000, which is the amount at present due the city from them.

Pacific Coast.—It is proposed to spend some $11,000,000 to bring drinking water from the Calaveras River to San Francisco, and the tax-payers, in view of the present cheapness of whisky and native wines, naturally complain of the unnecessary waste of money.

[We trust that this latter sentence is merely a bad joke.]

The last Legislature of Arizona passed an act awarding a premium of $5,000 for the first artesian water

obtained at a greater depth than five hundred feet, or $3000 for artesian water obtained at a less depth, in that territory.

MEMPHIS.—The recent sale of the Memphis water works, which was noticed by us, has been set aside by the consent of counsel, owing to the large number of injunctions growing out of the sale. The trustees will hold possession of the works and sell them again on sixty days' notice.

Aurora, Ill., wiser in its generation than Chicago and Boston, has established a "fire cistern" holding five hundred barrels of water, and bids defiance to great conflagrations.

MINNEAPOLIS.—A mouse caused a three weeks' delay in the finishing of the new pump at the city water works. The mould for the castings of the suction and discharge pipes was carefully prepared a week or two ago, and coated as usual with flour, in order to prevent the adherence of the moulding sand. Before pouring in the liquid iron, however, a mouse, attracted by the flour, crawled into the mould and made a hole by burrowing in the sand. The casting was consequently misshapen and defective, and the work had to be commenced over again.

NEW JERSEY.—The Hoboken Board of Water Commissioners have ordered the payment of $26,482.35 to the Jersey City Board, that being the amount due from the former to the latter city on account of the water rents.

[This payment was, we believe for six months, making about $53,000 per year. These people have been proposing lately to "jump from the frying pan into the fire" by spending a sum on a new water works the interest on which would be three or four times this amount, and that to secure a supply almost as dubious in quality as the present one.]

ELIZABETH.—The Elizabeth Water Company's dividend is 3 per cent. for the past six months.

BROOKLYN—THE HEMPSTEAD RESERVOIR.—It would take a column or two of our space to give the current history of the agitation about this topic. We shall give only at present an extract from the proceedings of one of the citizens meetings, containing important facts and figures:

A. A. Low called attention to the cost of the original water works—a vast work done under an excellent commission. Why was this Hempstead Reservoir so expensive a work?

Colonel Adams replied that the original cost was $4,500,000, and a conduit had to be made where an open canal had been at first intended. He said the estimate of the Hempstead Reservoir would not vary over $40,000 or $50,000, and claimed that this was as close as estimates usually were on public works.

Mr. Farrington said then they had nothing to do but raise that amount and go home.

Col. Adams said he did not make the law, and they had increased the proposed supply to 1,000,000,000 gallons.

Gas Items.

The Paterson Common Council, among items of tax ordinance approved, has for street hydrants $14,000, and for lamps $21,351.

AN INSOLVENT COWPANY COLLAPSED.—An application made in Supreme Court, Chambers, before Judge Brady, on behalf of the Attorney General, to bring a suit to wind up the affairs of the Union Gas-Light Company. The application is based upon the affidavit of Henry Morgan, a stockholder of the company, which states the capital stock of the company to be $2,000,090: that its only property consists of a block of land between Ninety eighth and Ninety-ninth streets and Second avenue and the East river, with the buildings thereon, which latter will require $25,000 to finish and $175,000 to put the company's gas house in proper condition for the manufacturing of gas; that a mortgage of $500,000 exists against the comprny, upon which interest has not been paid for two years; that unsecured debts to the amount of $110,000 remain outstanding against the company; that taxes and assessments to the amount of over $10,000 for last year remain unpaid; and that the accruing salaries of the company's officers and employes is increasing the debt of the company. It was asserted on behalf of the Attorney-General that the company was insolvent, and unless something was immediately done the stockholders of the company would get nothing for their interists in the stock. Judge Brady granted the application.

NEW GAS-HOLDER.—The Continental Works (T. F. Rowland), Greenpoint, N. Y., have the contract of a new gas-holder for the New York Gas-Light Co. It is to be of the same dimensions as one previously erected by this concern, and which is the largest in the country,—*Exchange*,

[As to the last statement, we are not sure, believing that one in Philadelphia is larger. The New York one holds 1,500,000 cubic feet.—ED.]

PARLIAMENTARY SIGNAL LIGHT.—The gas signal light on the clock tower of the Houses of Parliament is now shown from its new position, 30 feet higher than formerly. The new lantern is constructed to run in and out of a loophole in the roof of the tower—similarly to a ship's gun—so that during the daytime nothing is seen of it, and it is now no disfigurement to the appearance of the tower. The illuminating power is a Wigham's patent gas light, as used for lighthouses, and at present is shown naked, no lenses being used. The light is only visible while the House of Commons is actually sitting. Immediately on an adjournment the light is extinguished. This light is fully described on page 403, volume xxviii, and page 40, volume xxix.—*Scientific American.*

Governor Tilden signed June 10, the bill regulating the price and quality of gas in the city of Yonkers.

As a pendant to the French application of the thermometer to indicate by the coldness of the water the approach of an iceberg, a Californian has devised a plan of giving warning of the heating of a spontaneously combustible cargo, by means of a thermometer in the hold with a registering attachment on deck.

Boiler Explosions.

[From a Report of A. S. Hay, to the Secretary of the U. S. Treasury].

There can be no violent explosion from steam made from clean water, free from organic matter. At least, after many years' close observation, coupled with direct investigation and research, I have failed to find an instance where pure simple steam made from clean water ever exploded within a range of from 15 lb. up to 500 lb. pressure to the square inch. But I do find that explosions in steam boilers (like cholera, typhoid fever, etc.) revel in filth and foul water, and may be traced directly to the same source. Take, for instance the Mississippi and its tributaries, and it will be found that steamboat boiler explosions have been most frequent in the vicinity of large cities, and as we go down the river. The Lower Mississippi has been termed a graveyard, while in that portion of the river above St. Louis, including the Illinois, where the waters are comparatively pure and free from nitrogenous matter, explosions have been very rare, while the Ohio, from Cincinnati down, is noted for many steamboat disasters. The most destructive and terrific explosions have occurred in the spring of the year, when the waters were loaded with organic substances, earthy salts and oleaginous matters.

My researches lead me to a positive conviction that these disasters have their origin in the impurities contained in the water. In a paper like this it is impossible to go into detail, or to give reasons and incidents running through many years' observations, investigation and research, but I think that the following will give sufficient data to enable all to see the importance of avoiding foul water for domestic purposes:

When we boil foul water we find it tumultuous, accompanied with a low, bumping sound, with fits and starts, so sudden and violent in some instances as to jump bodily out of or even burst an open vessel. This antagonism to the boiling of any compound solution is caused by the attraction of these foreign particles for each other (chemical action and reaction), while in the boiling of pure water there is no chemical action whatever. Great rivers, like those in the Ohio, Mississippi, and Missouri valleys, are great natural sewers, and their waters at certain seasons of the year are loaded with organic remains in every stage of putrefaction, while city wells and those around factories frequently become great sink-holes and receptacles for foreign matter. My researches show that such waters hold in solution and carry in suspension from six up to sixty-three grains per gallon of organic substances, to which may be added copious quantities of oleaginous matter in certain localities and the salts of ammonia—N H_3. These substances find their way into steam boilers, where they rapidly undergo chemical change, distillation, concentration, and sometimes violent decomposition—that is, culminate in terrific explosion.

These organic skeletons, glycerine salts, albuminous substances and ammoniacal gases found in water consist chiefly of carbon, hydrogen, oxygen and nitrogen; and it is among such nitrogenous combinations and types that we find some of the most remarkable explosive bodies. They are not only aeriform, but they are gases of the most subtle and potent character; gelatinous substances, in which the different elementary atoms are all chemically combined in the same molecule that are liable to sudden and violent decomposition whenever the opposing forces to which they owe their existence become deranged by heat or some external cause. Their affinities are very feeble; hence their frequent destruction at high temperatures. Merely a molecular disturbance of any kind may cause violence. Their combustion being internal and instantaneous, they develop a force at least ten times greater and 100 times quicker than that of steam pressure—sudden and violent enough to destroy open vessels.

The instability of all nitrogenous compounds is the striking peculiarity. No amount of pressure or cold is able to reduce their aeriform gases to the liquid or solid condition again. But in clean water we have the most stable substance known, under three distinct forms, either of which may be safely had out of the other by merely a change of temperature. As I said before, heat alone will not decompose water, but electricity readily resolves it into its original elements, and chemical action being the source of electricity, water in the midst of fickle and treacherous company becomes demoralised and loses its virtue and stability, and goes off in a gaseous state in time of chemical reaction. This frequently occurs when boilers explode, as neither water nor steam are ejected from them, but an inflammable gas is evolved. Under such conditions the engineer, dead or alive, is convicted of murder for allowing the boilers to become dry, when, in reality, a moment before the explosion his boilers contained a full gauge of water.

[Who A. S. Hay is, we do not know. This, however, is neither here nor there. We must protest against the ignorance of chemical facts and principles, and the crudeness of the speculations comprised in the above. It has been widely circulated, and generally without question, throughout the world. That the U. S. Treasury Department should circulate such fallacies and crudities, is not creditable to our boasted civilization.—ED.]

☞ *For other reading matter see page* 10.

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WEDNESDAY, JULY 2, 1875.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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SECOND REPORT: ON THE ST. JOHN METHODS OF TREATING CRUDE COAL-GAS.

BY PROFESSOR HENRY WURTZ.

To the St. John & Rockwell Company—Gentlemen:—At your desire I have made a second series of chemical examinations of the working of the Straining Boxes of St. John, in connection with the St. John and Rockwell Dry Condensers, as in operation at the Works of the Harlem Gas-Light Company.

The object of these renewed experiments has been to ascertain the effect, in additional removal of impurities, of prolonging the contact between the gas and the condensed ammoniacal liquor; such prolongation having been contemplated—but not yet carried out— by duplicating the two straining-boxes now in use. This object has now been *provisionally* accomplished by causing the liquor from the present boxes—after settling to separate the tar—to be pumped up and showered down through the vertical columns of the condensers.

For the purpose of these experiments, the Harlem Gas-Light Company was good enough to confine their make, from June 2, onwards, exclusively to one uniform well-known gas-coal, the Murphy Run, of West Virginia; without any use of any enriching agent whatever. A purifying-box, freshly-charged with the St. John and Cartwright iron-oxide preparation, was also brought into use.

Some delays having occurred in getting the apparatus in working order, the analyses were not actually made till June 7 and 8, when the purifiers had been running a full week without changing. Two of my newly-invented Analytical Trains were attached, one immediately before, and the other immediately after the Purifiers. The figures obtained were as follows:

In 100 feet; grains.	Condensed unpu'fied gas	Gas newly puri fied.
Dust*.....		1.99
Smoke and Soot.....	64.52	
Tar.....	none.	
Naphthaline (c'dnsbl')	none.	
Fixed Ammonia-salts, (in spray).....	6.36	
Gaseous ammonia.....	148.57	4.68
Sulph. Hydrogen.....	917.11	none
Carbonic acid.....	1611.50	1624.50
Watery Vapor.....	1634.82	417.72

Mean tem. before c'd'nsers = 115°·84
" " after " = 99°·8
Mean difference = 16°·04

The general result is that the amount of ammonia left in the gas by the present mode of condensing is 148½ grains per 100 cubic feet, as against 237 grains reported previously, with the two boxes alone; a reduction of about 37½ per cent. The amount of sulphuretted hydrogen is also reduced, being 917 grains now against 1105 previously, a reduction of about seventeen per cent. In consequence, probably, of a greater heat on the benches, the mean temperature of the gas both on entering and leaving the condensers was much higher than on the former occasion in last October, comparing thus—

	Oct'r 1874	June 1875.
Entering Condensers.....	107.°5	115.°84
Leaving Condensers.....	84.°6	99.°8
Differences	12.°9	16.°04

The amount of *refrigeration* of the gas on this occasion was about five degrees higher than before, which of course has its bearing on the fact of the present greater condensation of ammonia and sulphur; though the final temperature was higher.

The amount of gas operated on, in the analysis of the purified gas, was *fifteen and a-half cubic feet*; the whole of which passed over a small slip of lead-paper kept permanently damp with dilute glycerine, without affecting its color; proving absolute absence of sulphuretted hydrogen. The ammonia was doubtless higher in the purified gas than it would have been, at an earlier stage of the running of the purifiers; but it is still within good limits.

The amount of gas made within the 24 hours during which the analyses were made, was 458,000 cubic feet, from 90,600 lbs. of coal, =5·055 feet per lb., of 16·98 candle power. On a previous day it was found to be 4·99 feet of 17·5 candle power. Average=5·023 feet of 17·24 candles, equivalent to a yield of ten thousand feet per long ton, of 19·4 candles. As stated in my former report, Murphy Run gas has been rated by me (when purified by iron-oxide, and condensed in the ordinary way) at 18·6 candles for 10,000 feet. The showing here is therefore again very favorable to the effect of the new condensation on the illuminating power.

Respectfully submitted,

HENRY WURTZ.

* Brought mechanically from the purifiers.

THE MOSES COOMBS APPARATUS.

There is one strictly American invention, applicable to the operating of gas-retorts, which, to our mind, has been overlooked, and treated with unmerited neglect. If this were not the case, however, there is very good reason for bringing the subject up again, inasmuch as it was introduced by the inventor himself to the AMERICAN GAS-LIGHT ASSOCIATION at the first Annual Meeting, in October, 1874, and will be found slightly referred to in the recent full publication of the Proceedings, page 17. As at that time no arrangements had been made for complete reports, and Mr. Coombs's statement was, we believe, wholly *viva voce*, the paragraph we now refer to, in the Proceedings, conveys little or no information. It is therefore that we have endeavored to supply the deficiency and have collected together all the necessary documents. Mr. Coombs's *English* patent, taken out more than three years ago, we give in full to-day, and we are also fortunate enough to be able to present a good cut forwarded to us by the inventor, with a brief specification, of some new and important improvements of construction of Mr. Coombs, in carrying out his methods. All this it will be proper to regard—though coming rather late in the day--as matter strictly belonging to the Proceedings of the American Gas-Light Association, and supplementary to the printed Proceedings of that body. It should really have been incorporated with that document, but this is a thing over which the writer had no control.

Since Mr. Coombs's English patent was issued, Mr. Mackenrot has brought forward, in our contemporary, the English *London Journal of Gas Lighting*, with a considerable flourish of trumpets, a patent of his own of later date, with a cut thereof, which those of our readers who also read that Journal, will doubtless remember, and which, to our own humble vision, is like enough to our American invention to be a twin brothe thereof. Mr. Malam also, has been, we believe poaching on the same manor. At present, however, we shall say no more. The whole is now on record, and History has it all.

PROF. SILLIMAN'S VINDICATION.

We have referred to the fact that Prof. Silliman has been attacked in his personal and professional relations, in connection with that horrible bugbear, the "Emma Mine," with such virulence and injustice as to lead to the production of a public card of denial from him, republished by us. This is a subject which in these columns can be followed up only in a very general way. The answers have been now, some time ago, put in, to the complaint of those parties who deemed themselves defrauded, because the mine has not turned out as many millions as they were led, or imagined themselves to have been led, to expect and to calculate upon. The reflex effect of these answers on the British public has come back to us, and we shall here append a most significant paragraph elicited from the "London Mining Journal." Instead of our distinguished American chemist being dragged through the mud in this matter, as his friends apprehended; it really begins to look as though even the mining speculators were going to prove an entire absence of more than ordinary chicanery on *their* part in this supposed stupendous swindle.

[From the London *Mining Journal.*]

EMMA SILVER MINING COMPANY OF UTAH.—It is generally known that an action has been commenced in the Supreme Court, New York, against Messrs. T. W. Park and H. Baxter, in connection with the transfer of the Emma Mine to the English company; and in the supplement to this day's Journal will be found a complete and careful abstract of the answers put in on their behalf. These answers appear to be very satisfactory, and the perusal of them will doubtless satisfy most shareholders that there has been an entire absence of fraud or misrepresentation either in America or England. At the present time the abstract will be of especial interest.

THE POTATO BUG.

The terrible tales that are told, regarding the rapid spread of this new insect pest, suggest that we have have here a most-excellent opportunity, coming up just in the nick of time, for testing the suggestions that have been made in these columns that the by-products, or nuisances, of the gas-house should be applied to the behoof of the Agricultural population—as well as all the rest of us, in reality—in an *insecticidal* way. This course would result in making a host of new and interested friends for the Gas Interest, and would give it an actual national importance.

In France, in connection with the pest that attacked and so severely crippled the vine, the great national staple of that country—the *phylloxera*, also of American origin—this subject has not been overlooked. During the year 1874, very elaborate experiments were made by one of the greatest of the French chemists, Dumas, presumably under government authority, upon gas-tar insecticides, and *with great success;* but Professor Dumas has chosen instead to commend to his compatriots, as a weapon against the phylloxera, a preparation of bisulphide of carbon, known as *sulphocarbonate of potash.* Whether such a preparation—which must needs be a product of special manufacture—would be preferable to, even if (which we do not believe) somewhat more powerful than the waste and now useless constituents of coal-tar, seems very questionable. We had some hope that somebody would have brought the thing up at the late meeting of the Gas-Light Association at Washington. It is an appropriate subject for the National authorities to interest themselves in; and the Association, for the reasons we have shown, owe it to themselves at least, to help in such an investigation. We could not have been there ourselves; and had we been so, might not have had any voice.

By all means let us know how our pretty Colorado lady-bug visitor, with the yellow-striped dress, will thrive on naphthaline, phenol, aniline and the other coal-tar alkaloids. Who will make the investigation, and teach our farmers how to save their potato-crops, otherwise doomed in and after 1876, the centennial year; which would then become a year of evil memory.

SULPHURIC ACID, FROM GAS COAL; FOR AMERICAN FARMERS.

While we are on *agricultural* subjects, let us glance at another of these, and throw out another pregnant suggestion, to form the germ of a great growth hereafter, of national and continental importance. Let us plant another of the seeds of future wealth and civilization.

Many years since we were greatly taken with the idea brought forward by Mr. Divine, chemist of this city, that, by using iron methods of purification, the sulphur of the gas could be recovered in form suitable for the making of sulphuric acid for agricultural use. We still adhere to the correctness of this principle of operation, and foresee the day when all the sulphuric acid and all the ammonia wanted as fertilizers will be obtained from our own gas works, instead of from Sicily and Peru, in the forms of sulphur and guano.

One month since we gave a very important article bearing on this subject, a letter to the New York *World* newspaper, from Prof. Sterry Hunt, of Boston (see this Journal for June 2, p. 206), in which that eminent chemist urged his idea of getting iron pyrites from Eastern Tennessee and Western North Carolina where the rocks are full of it, to make fertilizers. In reply to the *World* editor, who claimed that all pyrites contains *arsenic* and would make poisonous manures, Prof. Hunt honors the Editor of this Journal, by quoting old results (in 1858) of his investigations, demonstrating the *absolute absence of arsenic* generally from American pyrites, certainly from those of the great Alleghany Range; in contrast with the pyrites of Europe, where it is true that absence of arsenic is exceptional and rare.

Our present new suggestion is this. There are large and broad seams of very rich soft coals in the United States, highly adapted for gas and other purposes, which now are useless, from the large proportion of sulphur they carry, as *pyrites.* One region which is eminent in this respect is that of Clarksburgh, in West Virginia, with the Upper Monongahela country generally. We have seen seams of coal, many feet in thickness, otherwise rich, which contained one half their weight of pyrites. Now what we have to say here, of our own knowledge, is that this coal-pyrites is also absolutely *free from arsenic.*

What is to stand in the way of our separating the pyrites from these coals, by washing, or other simple method, and using the one for making sulphuric acid, and the other for fuel or gas purposes or for making coke? The topic need not be enlarged on at present, and we have not room either.

☞ It will be seen by advertisement on page 17, that the office of the Butler's Patent Coke and Coal Screening Shovels is removed from 96 Maiden Lane to Herring & Floyd, 740 Greenwich street, N. Y.

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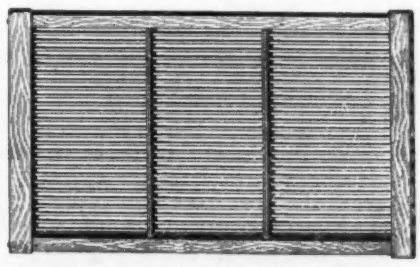

The Screen is made with an ash or oak frame, perforated with ROUND RATTANS, turned and reeved through, drawing the frame firmly together, strengthening it *without the use of nails or rivets.*

This Screen is reversible, can be used either side up, gives a large purifying capacity; there is no clogging by foul lime, as the rattan presents a smooth surface and can be cleaned very easily. It is considered by all Gas Engineers who have used it to be the best Screen now in use.

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We manufacture in connection with our RATTAN LIME HURDLES, which are the *best without exception,* a SLATTED WOOD TRAY, *cheap, strong, durable* and simple in construction, reversible, and *superior to other Wood Slatted Trays,* which we *offer at* LESS PRICE *than any other in the market.*

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The PELOUZE & AUDOUIN Condenser.

Patents, May 26, 1874; July 21 1874.

ADDRESS

JAMES R. SMEDBERG,
Consulting Engineer, San Francisco Gas-Light Co.,
San Francisco, California.

OR

HENRY CARTWRIGHT. C. E.,
2107 Green Street, Philadelphia, Pa.

Wonderful Retention of Heat.

On the 30th of October last, about 2 o'clock in the afternoon, the large new air shaft of the Belcher mine, then completed to the 1000-foot level, took fire and was destroyed. The timber of the shaft all burned out and the rock fell in and blocked it up. After mature deliberation it was thought that it would be better and cheaper to sink a new shaft than to try to clear out the old one, so badly were its sides caved and so great was the quantity of rock that had fallen into it.

The new shaft was sunk a short distance to the west of the old one. It has now reached a point near the 1000-foot level, where it will be continued down an incline. The incline was started at the 1000-foot level, and carried up to meet the vertical portion of the shaft. The course of this incline carried it through the remains of the old vertical shaft, but as soon as it was tapped the men found that they could do nothing in it on account of the ashes, burnt earth and rocks that poured down into their incline. A tunnel was then run until it had reached a point a short distance west of the old shaft, when a vertical upraise was made to the line of the proposed incline to be run up to meet the new shaft. The men then began to work down on the incline in order to reach the point from which they were driven in trying to come up.

They have succeeded in getting into the bottom of the old shaft, where, much to their surprise, they find the rock still red hot. In trying to put in timbers they were set on fire, and in order to work at all it is found necessary to bring a line of hose into the place and play a stream of water upon the rocks wedged in the bottom of the old shaft. There is no timber on fire among the rocks. They seem to have been heated to a degree so intense at the time of the fire, that they have remained red hot ever since. When we find so small a mass of rocks as can be contained in the bottom of a shaft remaining hot for over five months, after having been heated to whiteness, should we be incredulous on being assured by scientists that the center of the earth, once a molten mass of rock, still remains in a molten state after untold ages? Nearly three years after the great fire in the Yellow Jacket mine, places were found in the lower levels where the rock was still red hot.—*Virginia Enterprise.*

At the recent Celebration of the Centennial in Boston, June 17, the National Tube Works Company was represented by some fine specimens of lap-welded wrought-iron tubing, drawn by six large black horses on a wagon tastefully draped with bunting. The tubing, some of the specimens of which were very large, was effectively arranged to represent a cannon on a gun-carriage. The carriage was made of tubing, six sections on a side, the cannon being represented by a section of lap-welded tubing twelve inches in diameter, said to be the largest manufactured in the world. On each of the tubes of which the carriage is composed is the name of one of the original thirteen States, and on the large tube representing the "big gun" was inscribed, "Massachusetts, 1775—Our Union Welded, 1875."—*Boston Advertiser.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

JULY 2, 1875.

DELIVERED IN NEW YORK.

English Cannel.

Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00

English Caking Coals.

Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00

British Province Coals.

Pictou	2 50
Block House—At Mines, $2 12, Gold	0 00
Caledonia—At Mines, $2 00, Gold	0 00
Little Glace Bay—At Mines, 1 87½, Gold	2 00
Lingan—At Mines, $2 25, Gold	0 00
Sydney—Old Mine	3 00
" Reserve Mine	2 2
" International	— —

(Duty, 75 cents per ton, gold. Freight to New York $2 25 currency. Cost of above coals delivered in New York, $5 25 @ $6 00½, currency.)

Pennsylvania Coals.

Penn Gas Coal—At Amooy	$7 00	@	0 00
Westmoreland—At Amboy	7 00	@	0 00
(In New York both the above coals $7 50)			
Shafton	7 50	@	0 00
Youghiogheny	7 75	@	0 00

West Virginia Coals.

MurphyRun	$7 40	@	0 00
Despard	7 40	@	0 00
West Fairmont	7 40	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	7 40	@	0 00
Newburgh Orrel	7 40	@	0 00
Pinnickinick	7 40	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —

American Cannel Coals.

Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			12 50
Red Bank—at Philadelphia			7 60
" —at South Amboy			9 00

Asphalts.

Albertite of New Brunswick	$— 00	@	— 00
Ritchie Mineral of West Virginia	18 00	at Balt'e.	
Trinidad Bitumen	— —	@	14 05

The Waverly Coal and Coke Company of Pittsburgh, have contracted with the Pittsburgh Gas-Light Co. for 40,000 tons of their Youghiogheny coal, on private terms,

Advertisers Index.

☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.

GAS BURNERS, APPARATUS, ETC.

American Meter Co.—West 22nd st., N. Y., Arch and 22d st., Phil., 23 West st., Boston 11
Agency for the Gibson Improvement—W H. Grenelle, 42 Pine street, N.Y. 10
Cast Iron Gas and Water Pipe—S. Decatur Smith, York and Meyer streets, Phila., Pa 8
Cast Iron Gas and Water Pipes—R. D. Wood & Co., Philadelphia Pa 10
Cast Iron Gas and Water Pipe—Jno. McNeal & Sons, Burlington, N. J. 8
Franklin Foundry and Pipe Works—Jas. Marshall & Co., 23 Nineteenth street, Pittsburgh, Pa 2
Gas Valves (Chapman) 75 and 77 Kilby St., Boston, Mass.. 3
Gas-Burners—C. Gefrorer, 359 Commerce street, Phila., Pa 9
Gas Purification—St. John and Cartwright 5
Gaylord Iron and Pipe Company—90 and 92 Broadway, Cincinnati, Ohio 9
Gas Meters, etc.—Harris, Griffin & Co., 12th and Brown streets, Phila., Pa 10
Gas Meters, etc.—Wm. W. Goodwin & Company, 1012 Filbert street, Phila, Pa 11
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry st., Philadelphia, Pa 11
Gas Fixtures, Etc.—Archer & Pancoast Manufacturing Co. 67 Greene St. eet, above Broome, N. Y. 2
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway .. 7
Gasholders, Etc.—Deily & Fowler, 39 Laurel st., Phila., Pa.. 4
Gas and Water Pipes—B. S. Benson & Son, 68 B'way., N Y
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Philadelphia 2
Gas Screens—American Gas Screen Manufacturing Co., Haverhill, Mass 4
Jersey City Gas Meter Works, 14 Morris st., Jersey, N. J.... 8
Lime Hurdles.—Manhattan Lime Hurdle Co., Geo. W. Day, Treas., No. 3 Railroad Square, Haverhill, Mass 2
Lava Tips and Scotch Tips—Charles H. Meyer & Co., 227 Chestnut street, Phil. Pa 8
National Tube Works Co., 78 William St., N. Y 7
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Avenue C., N. Y. 4
Patent Gas Exhauster—Smith & Sayre, 95 Liberty street.. 4

GAS COALS.

Cannelton Coal Co. of West Virginia—J. Tatnall Lea, 325 Chestnut street, Phila, Pa 3
Despard Coal Co.—Parmelee & Bros., Agents, 32 Pine st., New York 7
Gas Coals—Bird, Perkins & Job, 27 South st., N. Y. 7
Monongahela Gas Coal—56 Exchange Place, Baltimore, Md. 6
New York and Cleveland Gas Coal Company—384 Penn Avenue, Pittsburgh, Pa 6
Ohio Gas Cannel—G. Merryweather, Pine cor. Wm. sts.
Peytona Cannel Coal—S. E. Low, 58 Broadway, N. Y 5
New York 3
Red Bank Mining Company—Bird, Perkins & Job, 27 South st., N Y 7
Sterling Coal—Freeman Butts, Cleveland, Ohio 6
The Newburg Orrel Coal Co.—Chas. W. Hays, Agent in New York, Trinity Building, 111 B'way, Room 7 6
Tyrconnell Gas Coal—52 S. Gay Street, Baltimore, Md 6

FOUNDRIES.

Atlantic Dock Iron Works—John P. Kennedy, Office 98 Liberty street, N. Y., P. O. Box 2348 .....
Cast-Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md .....
Continental Works—T. F. Rowland, Greenpoint 6
Camden Iron Works, Camden, N. J.—Jesse W. Starr & Sons 5
Gloucester Iron Works—J. P. Michellon, Sec., 6 North 7th street, Phila., Pa 4
Mill Street Foundry.—Geo. Stacey & Co., Cincinnati O 5
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman & Wilkins streets, Pittsburg, Pa 6
Pascal Iron Works—Morris, Taskar & Co., Philaelphia....12
Providence Steam and Gas Pipe Co., Providence, R. I.—H. A. Branch, Agent 3

WATER METERS, PUMPS, ETC.

Cast Iron Pipes for Water and Gas—Riley A. Brick, 112 Leonard street, N. Y. 10
Valves for Water, Steam and Gas—Ludlow Valve Man'g Co., 940 River street, Troy, N. Y 6
Water Pipes, etc.—S. Fulton & Co., 412 Walnut st., Phila... 7

CLAY RETORT WORKS.

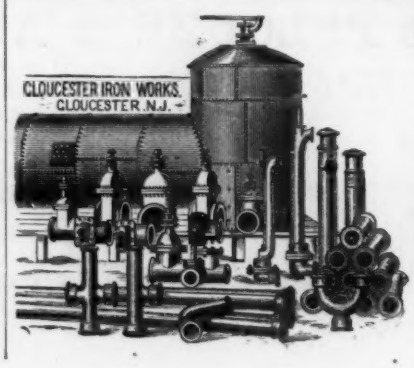
B. Kreisher, Clay Retorts, etc., 58 Goerck st., New York.... 8
Cheltenham Fire Brick and Clay Retort Works—Evens & Howard, 916 Market street, St. Louis, Mo .....
Jersey City Fire Brick Works—J. H. Gautier & Co., Greene, Essex and Bergen sts., Morris Canal Basin, N. J 8
Manhattan Clay Retort Works, 15th st., near Av. C, N. Y.. 8
Philadelphia Fire Brick Works, Vine and 23d sts., Phila.... 8
Retorts, Etc.—Geo. C. Hicks & Co., Baltimore Md .....

LAMPS, STOVES, PETROLEUM, ETC.

Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or A. M. Callender, office of this Journal 9

MISCELLANEOUS.

Analysis and Testing of Gas Coals—Prof. Henry Wurtz, 12 Hudson Torrace, Hoboken, N. J. 10
Architect and General Gas Engineer—William Farmer, 111 Broadway Room 95 5
American Gas Works Construction and Supply Company—61 Broadway, N. Y 3
Cements—S. L. Merchant & Company, 76 South st., N. Y...
Contractors for Gas Works, Etc.—Murray & Baker, Fort Wayne, Ind 2
Fodell's System of Bookeeping—A. M. Callender & Co., 42 Pine st., New York 1
Gas Engineer—B. E. Cholar, 914 Olive St., St. Louis, Mo...
Gear Wheels—Scott, 98 Chambers St., N. Y 5
Gas-Light Company of America, 63 and 64 Drexel Building, New York 2
Kidd's Gas Consumers Guide—A. M. Callender & Co., 42 Pine Street, N. Y .....
Massachusetts Institute of Technology—Samuel Kneeland Boston, Mass .....
National Coal Gas Company—H. P. Allen, 4 Warren street New York 6
Retort Setting and Working—E. S. Cathels, Montreal, Can. 8
School of Mines, Columbia College, East 49th st 9
Screening Shovels—O. R. Butler, 126 Maiden Lane, N. J 7
Scientific and Practical Chemist and Geologist—Profetsor Henry Wurtz, 12 Hudson Terrace, N. J .....
Screening Shovels—G. W. Dean, 1358 Broadway, N. Y.....
Springfield Gas Machine—Corner Canal and Centre St.....
Slade's Automatic Fire Governor—Jas. Slade, Gas Works, Yonkers, N. Y .....
Scotch Fire Brick—S. L. Merchant & Co., 76 South Street, corner Maiden Lane, N. Y .....
Works upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y 9



Gloucester Iron Works,

OFFICE—NO. 5 NORTH SEVENTH STREET,

PHILADELPHIA.

DAVID S. BROWN, Pres't. JAMES P. MICHELLON Sec'y.
BENJAMIN CHEW, Treas. WILLIAM SEXTON, Sup't.

CAST IRON GAS AND WATER PIPE.

Cast Iron Heating and Steam Pipe. Stop Valves. water or Gas.

Fire Hydrants,

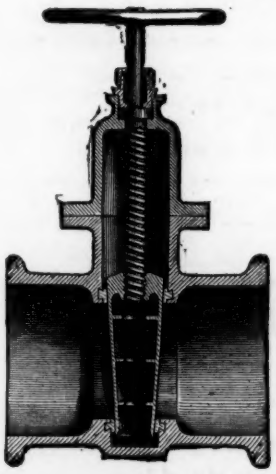
GAS HOLDERS.

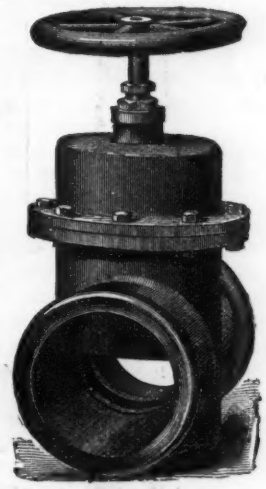
CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

CHAPMAN GAS VALVES.

Office and Sales Room 75 and 77 Kilby Street, Boston.





These Valves have been in use for several years, and are pronounced by all who have used them to be

The Best Gas Valves Ever Made.

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

There is no LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHT and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.

We refer to the following named Gas-Light Companies among the many that have used these Valves:

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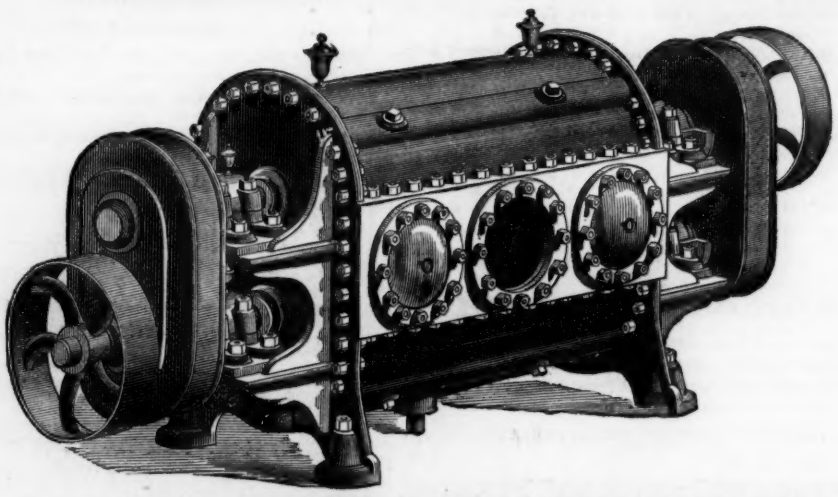
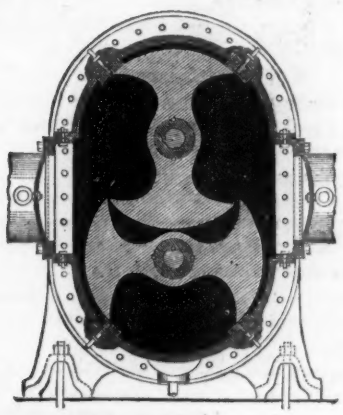
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
CITIZENS GAS-LIGHT COMPANY, NEWARK, N. J.
WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y.

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.
357-tf

PATENT IMPROVED GAS EXHAUSTER.





P. H. & F. M. ROOTS, PATENTEES AND MANUFACTURERS, CONNERSVILLE, IND.
S. S. TOWNSEND, GENERAL AGENT, 31 LIBERTY STREET, NEW YORK.

The following are some of the advantages we claim for this Exhauster over all others:

FIRST.—It is simpler in its mechanical construction than any other Exhauster in use.

SECOND.—The internal parts consist of only two revolvers, each cast entire in one piece, without a single screw, bolt, nut, washer, key, or other part to get loose on the inside and stop or break the machine. The internal operating parts, therefore, can not get out order, and hence require no care or attention.

THIRD.—Every part of the machine requiring care or attention, as the journals, gearing, etc., is external, easily observed and attended to. All changes, adjustments, and repairs are made from the outside. The journal bearings, if necessary, can be renewed in a few minutes.

FOURTH.—The internal operating parts are practically gas-tight, but are not in actual contact, hence there is no internal friction or wear. The machine is therefore operated with less power than any other.

FIFTH.—They are built in the most complete and substantial manner, with steel shafts and improved journal bearings, and their durability is almost without limit.

We build them of any required capacity, large or small, adapted to any kind of works or place.

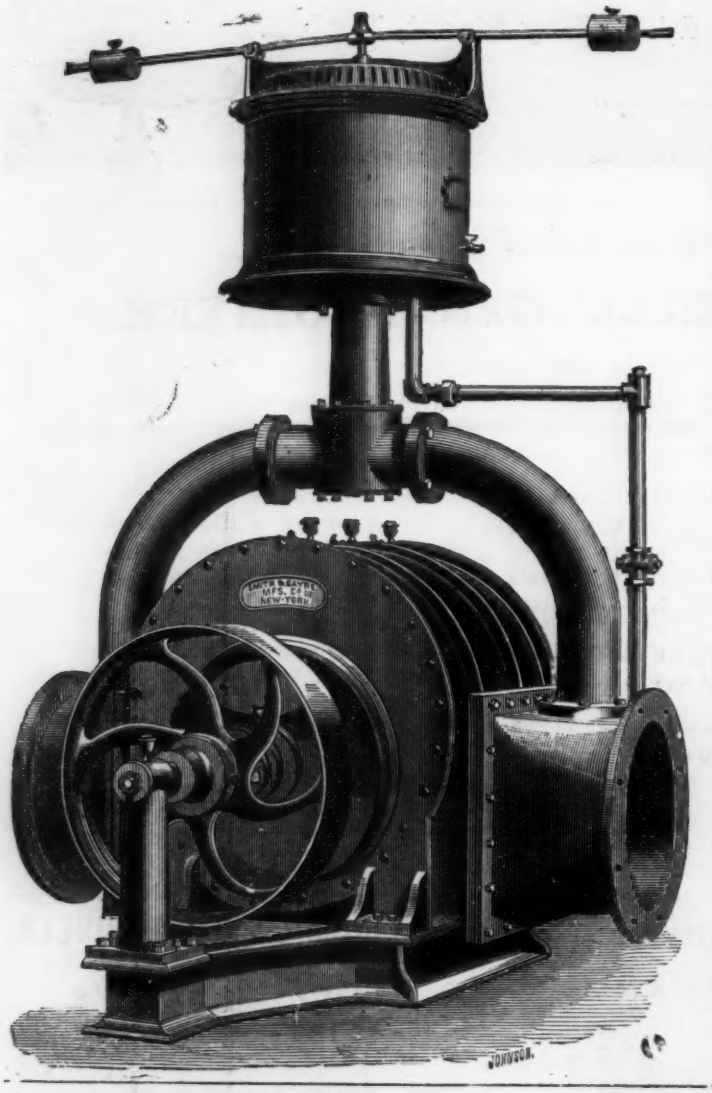
Send for Illustrated Catalogue, giving all particulars as to capacity, speed, power required, dimensions, and price of each size, and references to parties using them.

P. H. & F. M. ROOTS.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-jo ints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary fan. The Cupolas are manufactured in sizes to melt from 1 to 50 tons per hour, will save one quarter of the time required by the old style Cupola and 33 per cent fuel. Address

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OFFICE, 96 LIBERTY STREET, New York.

P.P. DEILY, 1842. J. FOWLER. 1874.

DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PA.,

Builders of Gas Works.

MANUFACTURERS OF

GAS-HOLDERS,

Single and Telescopic.

WROUGHT IRON ROOF FRAMES,

COAL WAGONS,

COKE BARROWS,

AND ALL

Wrought Iron Work

CONNECTED WITH GAS WORKS.

☞ Particular attention paid to Extensions and Repairs.

NEW YORK AND CLEVELAND GAS COAL COM'Y

Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

YOUGHIOGHENY GAS COAL.

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation. on most favorable terms.

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Branch Office—C. & P. RR. Coal Pier,
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W. H. WATERBURY & CO., General Sales Agents,
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SLADE'S AUTOMATIC FIRE GOVERNOR.

PATENTED AUGUST 4, 1874.

It regulates the speed of Exhausters by controlling the fire. The least pressure on the Retorts opens the Damper in the Boiler Chimney and under the fire, and closes them as soon as the pressure is removed. Saves the boiler, fuel, and all attention, except to supply the fire. Come and see it, or address

JAMES SLADE,
Gas Works, Yonkers, N. Y.

Gas Engineers,

AND PARTIES ENGAGED IN THE BUILDING OF

GAS WORKS,

who desire information regarding PETROLEUM GAS, either for use pure, or for enriching, are requested to address, stating particulars.

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FOR SALE,

200 Tons CANNEL CHIPS.

Address H. E. HOY,
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Camden, New Jersey,

Philadelphia Office, People's Bank Building, 435 and 437 Chestnut Street.

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ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

Wrought Iron Roof Frames,

For Retort and other houses Retorts and all castings required for setting them in the latest and most improved model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varying from 2,000 to 2,000,000 cubic feet daily purifying capacity.

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for Purifiers. Station Meters of all sizes.

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With cast iron guide and suspension frames. GAS REGULATORS or REGULATORS, STREET MAINS, from 1¼ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

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All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. JESSE W. STARR, JR.

Portland Cement,
Roman Cement,
Keene's White Cement,

NUMBERS 1 AND 2.

From best London Manufacturers.

FOR SALE BY

S. L. MERCHANT & CO.,

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Corner Maiden Lane. 344-1y

THE DESPARD COAL COMPANY

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DESPARD COAL

To Gas Light Companies throughout the country.

Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
Company's Office, 29 South street, }

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*** Reference to them is requested. 204-1y

B. E. CHOLLAR,

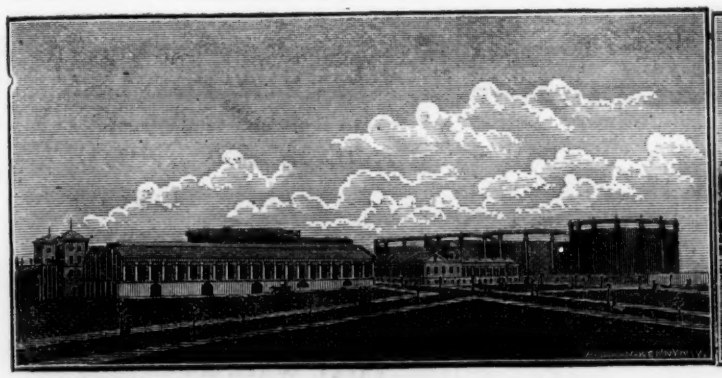
GAS ENGINEER,

914 OLIVE STREET, ST. LOUIS, MO.

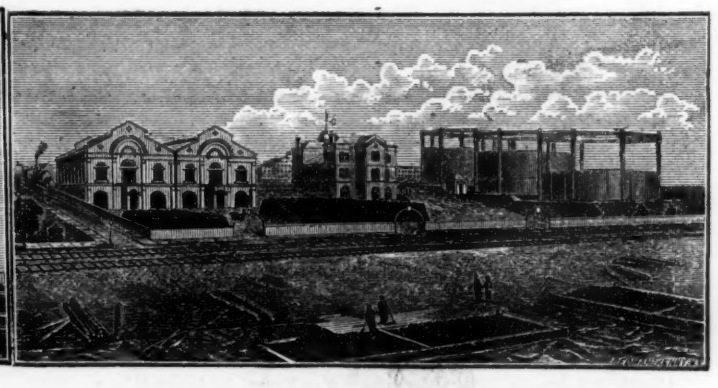
365-

SITUATION IN A GAS WORKS WANTED. A young man, a mechanic, with some experience in Gas Works desires a place. Can perform the duties of the street or office. Would undertake the charge of a small works.

Address the Treasurer of the TRENTON GAS-LIGHT Co., Trenton, N. J. 364-6t



CINCINNATI GAS WORKS. ERECTED 1871-72-73.—WM FARMER, ENG.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

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WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description o buildings W furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
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Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

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GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company. St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal.

PATENT FOR SALE.

To Fire Clay Retort Manufacturers.

W. D. CLIFF, of the firm of JOSEPH CLIFF & SON, Wortley, Leeds, England, has recently obtained Letters Patent for the making of CLAY RETORTS by machinery. Besides being made cheaper, they are also made much better than by hand. They are regular and equal in their thickness, and in their length are true and straight throughout, being in all respects far better and handsomer than hand made Retorts. The fact that Messrs. Cliff & Son have for many years been very largely engaged in the making of Clay Retorts will be a sufficient guarantee as to value of the patents. The patentee is wishful to sell the patent right for America. It is No. 55,069, and is for seventeen years from the 15th day of September. 1874.

All particulars may be learned on application to

W. D. CLIFF,
580-6t Wortley, near Leeds, England.

B. S, BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,

BALTIMORE, MD.

$30 per Dozen.

DEAN'S

NEW PATENT (1873)

Screening Scoop SHOVEL

FOR COKE, COAL, ASHES, AND OTHER SUBSTANCES.

The frames are 12 by 18 inches, with seven bars, and are made of the best malleable Iron. They can be wired between bars by an arrangement of holes a quarter of an inch apart, by an ordinary person, to screen any size substance desired. They are warranted to be the most durable and practical Screening Shovel made, or money refunded.

Reference—All New York Gas Companies and Hotels.

Price, $30 per Dozen.

Sample sent gratis to any Company, if desired.

☞ Smaller sizes on hand. Please address orders to A. SEE & SON,
N. Y. Shovel Works, No. 1358 B'way, N. Y

FOR SALE.

On or about May 1st, 1875,

One 8 Ft. STATION METER

complete, of American Meter Company's make, with a capacity of four hundred thousand cubic feet per day.

For price and any other information address

H. STACEY, Eng'r and Sup't
Indianapolis Gas-Light and Coke Co.,
375-6t Indianapolis, Ind.

MECHANICAL & GAS ENGINEER.

To Gas-Light Co's.

The undersigned respectfully announces his voluntary resignation of the Vice-Presidency of the American Meter Company from the 1st of March last, after filling that position from its organization in 1863, and now offers his services as

Consulting or Constructing Engineer,

in the erection of new, or the extension of Gas Works.

He is prepared to furnish plans and Specifications, embracing all the latest improvements in the MANUFACTURE OF COAL GAS, at short notice, and on reasonable terms. His experience of THIRTY YEARS in the construction of Gas and Water Works, Railroads, Tunneling, etc., enables him to refer with confidence to any of the Works erected by him, as a guarantee of satisfaction and ability.

By arrangements with reliable manufacturers of all MATERIAL and SUPPLIES used by Gas Companies, he is prepared to furnish promptly all such orders, with best selections, and to give satisfaction as to prices, terms, etc., and respectfully solicits a share of patronage.

HENRY CARTWRIGHT, Gas Engineer,
2107 GREEN STREET, PHILADELPHIA. 379-6t

KIDD'S

Gas Consumers' Guide

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.,
42 Pine Street, New York, Room 18,

THE

PENN GAS COAL COMPANY

OFFER THEIR

COAL, CAREFULLY SCREENED,

AND PREPARED FOR

GAS PURPOSES.

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station the Pennsylvania Railroad, and on the Youghiogheny River.

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No. 11 Merchants Exchange, Phil'a. 90 Wall Street, New York.

PLACES OF SHIPMENT.

Pennsylvania Railroad, Pier No. 2 (Lower Side).
Greenwich Wharves, Delaware River.
366–1y **Pier No. 1 (Lower Side), South Amboy, N. J.**

CANNELTON COAL CO.

OF WEST VIRGINIA.

Offer for sale the following Coals, from their Colliery at CANNELTON, Kanawha County, West Virginia, delivered at RICHMOND, Va.:

CANNELTON CANNEL,

acknowledged to be the most valuable ENRICHER produced in this country, a gross ton yielding 10,000 cubic feet of GAS of 64·54 CANDLE POWER; COKE 32 bushels, of good quality.

CANNELTON SPLINT,

a SEMI-CANNEL of an excellent quality, a gross ton producing 9,500 cubic feet of Gas of 20 CANDLE POWER; COKE, 30 Bushels, fair quality.

CANNELTON CAKING COAL.

Recent experiments made with this Coal have established the fact that the Kanawha Valley can furnish GAS COAL equal to those produced from any other section of the country; that mined by the Cannelton Co. yielding from the gross ton 10,000 cubic feet of Gas of 16 CANDLE POWER 35 bushels of COKE of *superior quality*—only *one* per cent. of *sulphur*.

SAMPLE CARGOES shipped to any required point, on application to the undersigned, from whom full information can be obtained.

J. TATNALL LEA, Treasurer, P. O. Box 1747 Philadelphia.
SALES AGENTS { **PERKINS & JOB,** 27 South Street, N. Y.; 91 State Street, Boston.
H. W. BENEDICT & SON, New Haven.

ARCHER & PANCOAST MAN'G CO.

DESIGNERS AND MANUFACTURERS OF ARTISTIC

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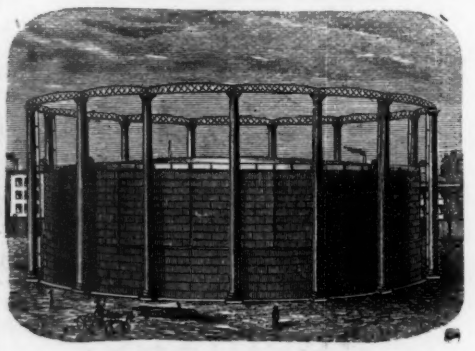

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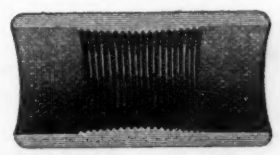

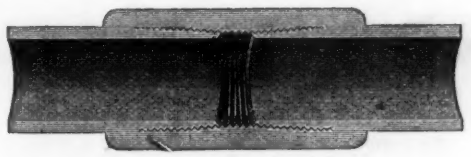

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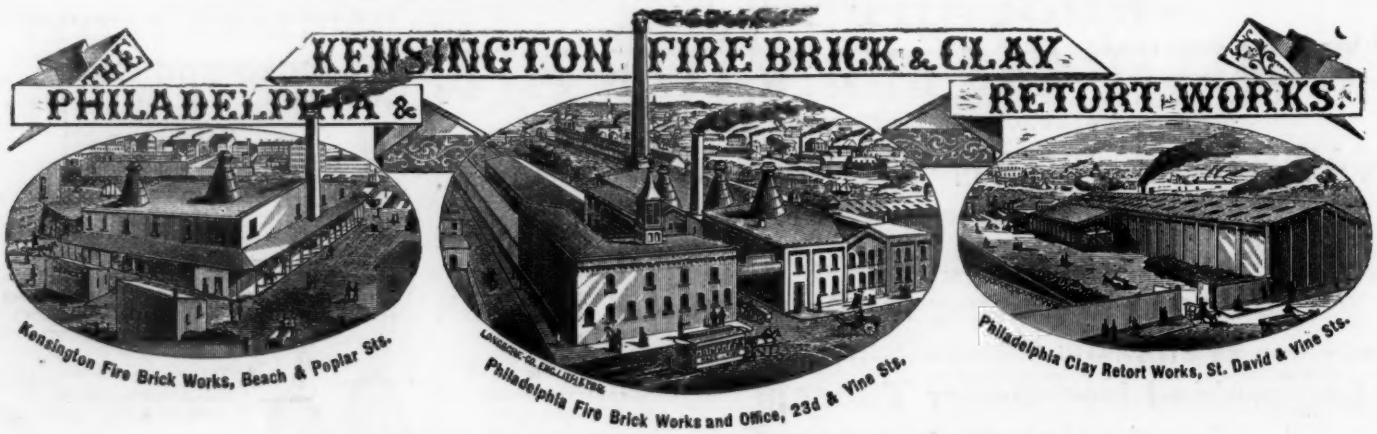
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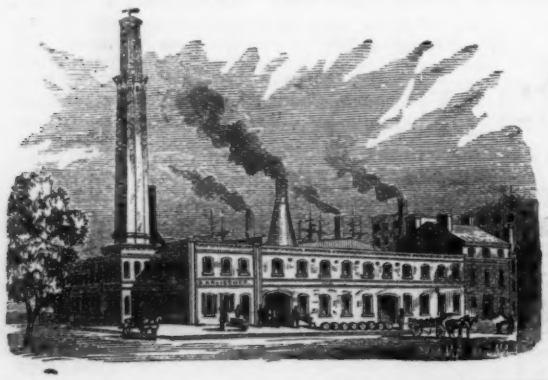

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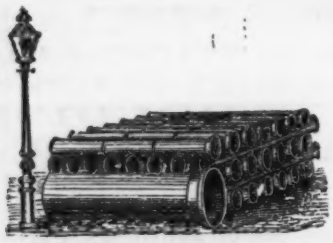

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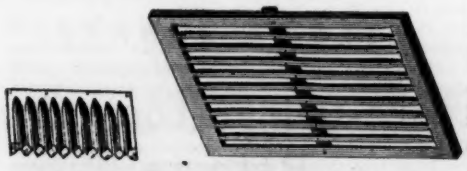

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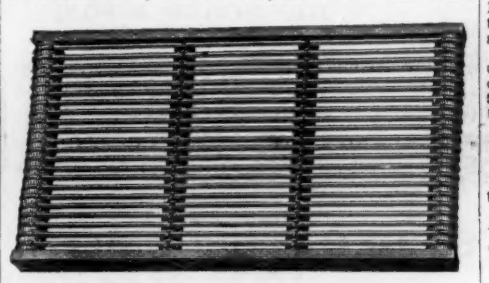

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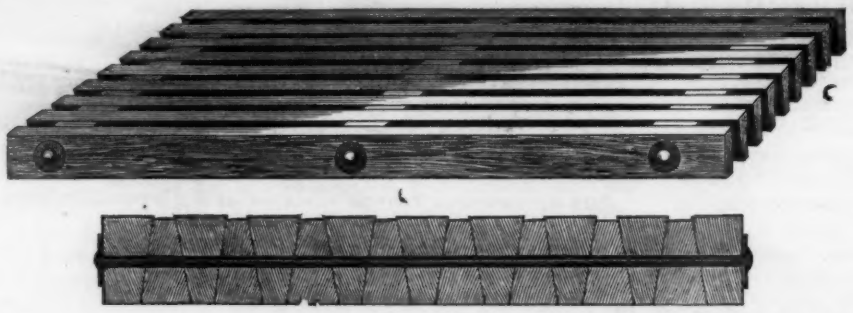

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